

PHYSIQUE
by
P. VON BOECKMANN



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Yours for Vitality
O. von Bockmann

July 1970



PHYSIQUE

A TREATISE ON

DEEP BREATHING

AND THE

Care and Development of the Lungs
and Muscular System

BY

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INTRODUCTION

In writing this book I have made no attempt to produce a classic in the realm of literature; on the contrary, in order that the facts I present may be deeply imbedded in the mind of every reader, I purposely have adopted terse language. The subject under discussion is of such vital importance that it cannot be brought too forcibly before the notice of every man, woman, and child. The terrific strain of our present day mile-a-minute method of living is slowly but surely undermining the very foundation of our existence, and unless we take determined steps to counteract this evil, we may, in a few

generations, find ourselves a race of weaklings, unable to compete with, and defend ourselves against, other races that have not allowed their life's blood to pale. When I speak of we, I mean the white race, especially the American nation. Nowhere on earth is hygiene given less attention than in our own country. Vital statistics prove that we are rapidly deteriorating into a race of nervous wrecks. Our bodies are too frail to nourish our over-active brains. We need more blood and better blood, more physical strength, greater endurance, greater recuperative power, so that we not only may retain our existent forces, but that we may also strengthen them.

In the chapters that follow I shall express my views as to the most direct method of attaining the desired results. The teachings are based on experience, not theory. I spent ten years in theorizing and experimenting, trying every known hygienic practice before the public, from vegetarianism to the meat cure, from violent physical exercise to Delsarte movements, steam baths to cold baths, etc. I then put the knowledge gained into actual practice by teaching over

30,000 pupils in all parts of the world during the last eight years. In fact there is not a civilized spot in the world where I have not had one or more pupils. I have had, therefore, experience in the development of vitality and strength with all kinds of subjects, under all kinds of conditions. Thus it is with a firm and indisputable foundation that I claim that the teachings set forth in this work are the result of **EXPERIENCE**, not theory.



CHAPTER I.

THE VITAL FORCE OF LIFE.

A robust physique is principally a matter of having abundant, rich, pure blood. The blood is the seat of all force, both muscular and nervous. It is the Stream of Life. It is the blood that protects us against disease. It is the blood that gives us bodily warmth. It is the blood that stimulates and nourishes the brain, so that we may think and act. It is the quality and quantity of blood existing in us that determine the degree of our vitality, endurance and strength.

THE BLOOD AN ORGAN.

Although the blood is not usually termed an organ, it may appropriately be so considered, in fact, it is the Supreme Organ of the body. It is Nature's law that every other organ, every muscle, and in fact, every one

of the millions of minute cells that form the human body, shall fulfill its duty in enriching and purifying the blood.

The most important physiological act concerned in the maintenance of the proper equilibrium of the blood, is Respiration—therefore it is the prime object of this book to describe this act, and show its physiological import in the development of health, strength and vitality.

THE VITAL FORCE OF LIFE.

Breathing is the vital force of life. One can go without food for weeks, without water for days, but check the free flow of air to the lungs for but a few seconds, and immediate death will result. No other aliment absorbed by the body, whether food, water, or any other substance required to sustain life, is as necessary as air. Air is to the human body what draught is to a furnace. Cut off the draught—Oxygen—and you will kill the fire, no matter how good or how much coal you use. Cut off the free supply of Oxygen to the lungs through shallow breathing, and your blood will become impover-

ished and poisoned, no matter how good or how much food you may eat. The faster you run, the faster you must breathe. The more intensely you think, the more Oxygen is consumed. Every act of the human body from the winking of an eyelid to the lifting of enormous weights, means the consumption of Oxygen, which can be replaced only in one way, and that is by breathing. Even every nervous impulse, every pulsation of the heart, means that a certain amount of fuel has been consumed, and that the process has left in the blood a deadly poison, Carbon Dioxide. So deadly is Carbon Dioxide that should it be permitted to accumulate and remain in the blood but a few seconds, every cell in the body would become mortally infected, and death would result immediately. It is the duty of the lungs to free the blood of this poison. The black venous blood, as it passes through the lungs in its circulation, exchanges Carbon Dioxide for life-giving Oxygen. Thus the lungs perform a great double duty—they oxygenate the blood and also purify it.

BREATHING ESSENTIAL TO HEALTH.

Every physician, every physical culturist, in fact every student of hygiene, concedes that breathing is the most important function of the human body. This fact stands forth pre-eminently from the mass of contradictory theories on hygiene and physi-culture. Evidence which we cannot doubt proves that, without proper breathing, health and vitality are impossible.

Though breathing does play such a vital role in our lives, the fact remains, that this important function is but little understood, even by our physicians. They may know the fundamental laws governing respiration, and they may have a good understanding of the respiratory muscles, but very few really understand the mechanical action of the breathing apparatus sufficiently to be able to assist a shallow breather to correct his weaknesses. Furthermore, it is plain that the medical fraternity forgets the importance of proper respiration, or it would give the subject more attention than merely advising patients to practice breathing in a hap-hazard manner.

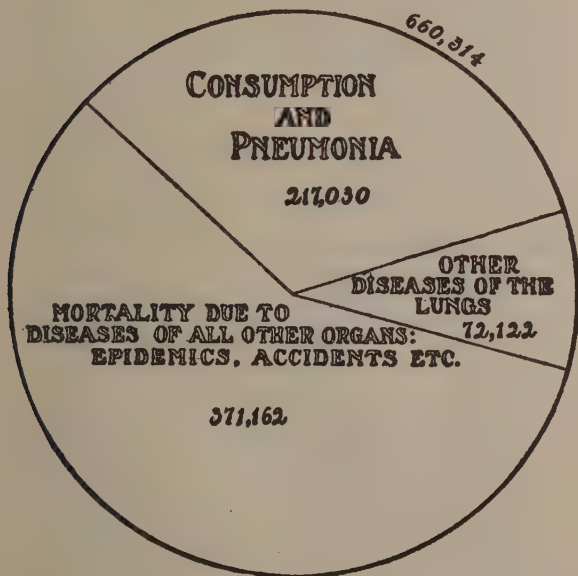
CHAPTER II.

CIVILIZED MAN IS WEAK-LUNGED.

We have degenerated into a race of poor breathers. Very conservative statisticians estimate that nine out of every ten persons have deficient respiratory power. Having measured the breathing capacity of thousands of subjects, my experience in this matter has shown that the above statistics are extremely conservative, and that in fact a large lunged, full breather is very rare. Other than among great singers, there are few men and women with normal lung power.

The best evidence that civilized man is weak-lunged, may be derived from a careful study of the vital statistics of any of our civilized nations. For an example—the last U. S. census revealed the fact that the number of deaths annually in the U. S. was 1,039,094. Of this number, 378,780 occurred in persons under the age of fifteen years.

VITAL STATISTIC CHART.



Of the 660,314 above the age of fifteen years, 217,030 deaths were caused by Consumption and Pneumonia. Other diseases of the lungs caused 72,122 deaths. Hence we find that diseases of the lungs cause almost one-half of the deaths of adults. How many children die annually of weak lungs, is difficult to estimate, but it is reasonable to assume that the percentage is still greater.

With the foregoing terrible statistics staring us in the face, it is foolhardy to assume that even the strongest among us is absolutely free from the danger of succumbing to one of the two greatest destroyers of human life, Consumption and Pneumonia. The thin anaemic of to-day may be a victim of the terrible Tubercular Bacillus to-morrow. The large-chested, ruddy-faced Hercules may, at any minute, contract a cold, which may develop into Pneumonia. It has been observed that the lungs in 90 per cent. of the cadavers used in the colleges for dissecting purposes, show signs of having at one time been attacked by Tubercular Bacilli.

These facts show that thousands of us are walking on the edge of a precipice without being aware of the danger. Should one,

however, suggest to the average man that his lungs are weak, he would combat the accusation vehemently: suggest to him, however that his stomach, liver, or even his heart is not normal, and he will admit that such may be possible. Even a consumptive in the last stages of the disease often vainly tries to ease his mind by attributing his weakened condition to some cause other than his lungs.

PHYSICIANS FAIL IN THEIR DUTY.

While I am not endeavoring to make a tirade against physicians and medicine, the truth is that medical men are greatly to blame for the terrible loss of life from pulmonary troubles, in that they fail to realize the importance of lung culture, and do not warn the public of its danger. On the contrary, our physicians assure their patients that their lungs are "as sound as a dollar," simply because the physician cannot detect any actual condition of disease.

Richard Cole Newton, M. D., in a paper on the subject of deep breathing read before the American Climatological Association at

the Sixth Triennial Session of the Congress of American Physicians and Surgeons, held in Washington, May 12, 13, and 14, 1903, maintains that the medical fraternity has too meagre knowledge on the subject, and well deserves the "more or less contemptuous way in which physical culturists, etc., speak of it." "The profession owes it to itself to study more deeply into this vital question, and to be able to instruct the laity fully upon all its bearings."

Dr. Newton sums up his paper with the following conclusions:

1. Deep breathing is essential to good health, and is, in many cases, a valuable therapeutic measure.
- 2 Its importance is not at all generally appreciated.
3. It should be part of every child's education.
4. It is especially indicated for backward and sickly children.

Since the average physician's diagnosis of the condition of the lungs cannot be depended upon, there is but one way to be absolutely positive that one is immune to Con-

sumption and Pneumonia, and that is to keep the lung tissue in the prime of health by means of persistent and physiologically systematized breathing gymnastics. If this be done, we shall not only be immune to diseases of the lungs, but we also shall enjoy the highest degree of physical and mental strength and endurance of which our body and mind are capable. In the chapters that follow, the layman will be given a thorough understanding of the mechanical action of the lungs and breathing muscles, and will, I hope, be awakened to a realization of the absolute necessity of systematic breathing gymnastics.



CHAPTER III.

THEORIES REGARDING THE LUNGS.

To understand the mechanism, anatomy, and physiology of the lungs, demands essentially a knowledge of the circulation of the blood, and the composition of air. These subjects were so unknown to the ancients that they possessed very little accurate knowledge concerning the functions of the respiratory organs, as we readily note from their writings. They presented many interesting hypotheses and tangible theories regarding the subject, but they were most reluctant in yielding to the truth when they were first awakened to their errors.

Hippocrates, one of our first great philosophers, treated largely of air and water. Air he considered as one of the principal aliments of life. The ancients, however, generally believed that the air they breathed

maintained a kind of "vital fire" in the heart, and that the blood was tempered in the lungs. From this we see that they fully realized the great importance of respiration, and had a vague conception of the relation existing between the condition of the blood and the air breathed.

In the writings of other Greek philosophers on the respiratory functions, very little deserving of notice is found. Plato, in his *Tineus*, says that the "Genii placed the lungs in the neighborhood of the heart to keep it cool and in exact obedience." Galen believed that the chief function of the lungs was to carry off vapors equivalent to smoke from a fire. It is evident that he, too, realized the importance of respiration.

Other philosophers believed that the only duty of the lungs was to keep the heart in motion. Such were the theories that prevailed in the time of Descartes, Bertier, Van Halmont, Stevenson, Malpighius, Lister, Vieussenius, Bryan, Robinson, Lorver, Whytt, Crooke, etc.

Not until 1667 was the respiratory act correctly described, and even for a hundred

years after that the theory had few believers.

Hook, in 1667, made the first experiments in artificial respiration, keeping a dog alive by the use of bellows.

Dr. James Keill, in 1708, made some accurate cubic measurements of the air breathed out of the lungs. Some 50 years later, Lavoësier, Priestly and Scheele, greatly increased the knowledge of respiration by discovering the composition of the atmosphere, and respired air.

From the time of these men to the middle of the 19th century, little was known in regard to respiration. To John Hutchinson should be given the credit of making the first scientific researches. He was practically the first one to show to the world the value of the Spirometer, and to give us a clear idea of respiration. In 1846, Hutchinson first placed before the world the result of his researches, in which he included comparisons of the lung capacity of persons of different height, weight and age.

Strange as it may seem, no modern writer has made any noteworthy advance upon Hutchinson's writings. To-day, our text

books quote Hutchinson's views regarding respiration, and, when giving statistics, employ his figures.

Hutchinson may justly be crowned the "Father of the Science of Deep Breathing." It is only to be deplored that not one of our great modern scientists has given the subject the attention it deserves.



CHAPTER IV.

THE LUNGS AND CHEST.

Since this work is intended principally for the layman, I shall not enter exhaustively into the construction of the lungs, and show how wonderfully and mechanically perfect Nature has arranged the breathing apparatus, but rather shall give a general description of their construction.

Since it is the function of the lungs to cleanse and nourish the blood, they are especially constructed for bringing the blood as near as possible to the aerating medium, air. In order that a very large area may be exposed to inspired air, the lung tissue is a structure of many millions of cells, variously estimated from five hundred million to over a billion, which, in the average person, represents an area of over 1,400 square feet. Interwoven with these countless billions of minute cells are the blood vessels which carry the blood from the heart to be purified, and after having been oxygenated, return it

again to the heart, from whence it is further distributed throughout the body. The only tissue interposed between the blood and the air breathed into the lungs, is the thin wall of the blood vessels, and the delicate membrane supporting these blood vessels.

The maintenance of life necessitates the continual absorption of Oxygen and excretion of Carbon Dioxide, the blood being the medium by which these gases are carried. In the act of breathing, the blood absorbs Oxygen in the lungs from the air that comes from without, and conveys this Oxygen to all parts of the body; secondly, in the circulation of the blood through the body, it absorbs Carbon Dioxide, which is cast off during exhalation. The lungs thus offer a medium for the exchange, on the part of the blood, of Carbon Dioxide for Oxygen.

Having given a brief description of the lung tissue, I shall proceed to describe the construction of the thorax.

The thorax is conical in shape, narrow and immobile above, broad and flexible below. There are twelve ribs on either side, the breastbone in front, and the spinal column behind, which together form the bony framework of the thorax. Interposed be-

tween the ribs and breastbone is cartilage, which gives the ribs elasticity of action. Behind, the ribs are attached to the spinal column. As the seventh rib is the longest, and the first the shortest, the former is the most mobile and the latter the most immobile.

THE DIAPHRAGM.

This conical cage forms the bony framework that encloses the heart and the lungs. The base of this cone is a large, broad, dome-shaped muscle, the diaphragm, which supports the heart and lungs, and also forms the roof of the abdominal cavity. The abdominal cavity, being conical in shape, also has for its base the diaphragm. The diaphragm, therefore, by virtue of its position, acts as a partition wall between these two cones. It is thus that it derives its name, *diaphragm* meaning "partition wall" (from the Greek).

To understand the action of the ribs requires a thorough knowledge of mechanics. The arrangement of the muscles that act upon the ribs and cause them to move, is quite complicated, and of interest only to those desiring to enter exhaustively into the

THE LUNGS AND CHEST.

Figure 1.

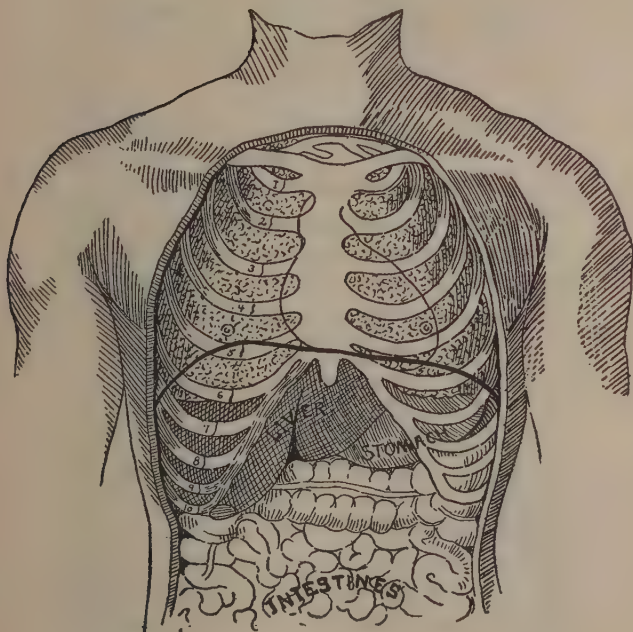


CHART SHOWING THE FORMATION OF THE TRUNK,
AND RELATIVE POSITION OF THE VITAL ORGANS.
THE HORIZONTAL BLACK LINE REPRESENTS
THE DIAPHRAGM.

study of respiration. Therefore I shall enter only deeply enough into the subject for the student to obtain a general idea of how the respiratory muscles exert force upon the ribs, and give them motion.

THE MECHANICAL ACTION OF THE RIBS.

The ribs are attached very obliquely to the spinal column and breastbone, to which they are hinged (see figure 1). It will be observed that if the ribs are raised just as the bale of a bucket when hanging at the side may be raised, this motion causes an increase in the lateral diameter of the chest. In the ribs, however, there is also an action that permits of an increase in the antero-posterior diameter of the chest, that is, in the depth of the chest from front to back. The rear ends of the ribs are prevented from movement by their direct attachment to the spinal column. The forward movement of the breastbone, on account of its construction, and relation to the ribs, is greater at the lower end than at the upper end. The accompanying illustrations Nos. 2 and 3 give a clearer idea

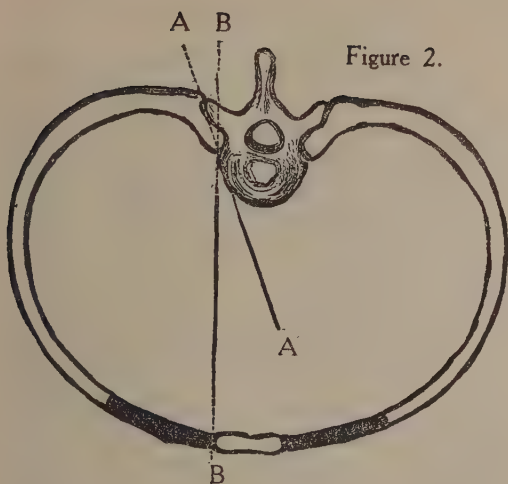
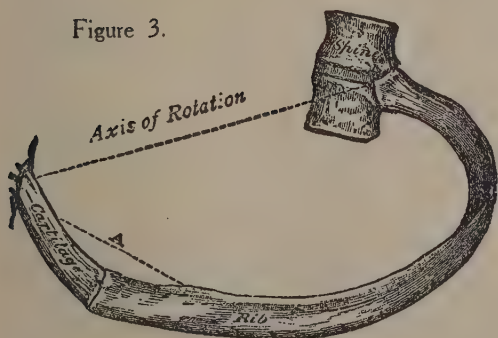


Figure 3.



of the rotation of the ribs. In the movement of the ribs, there are two axes of rotation, one being represented by A. A., the other by B. B. Fig. 2. The raising of the ribs is accompanied by a slight straightening of the angle represented by A in Fig. 3, which permits the increased antero-posterior diameter of the chest.

Attached to the ribs are numerous muscles. The external and internal costal muscles pass from rib to rib in such a manner that their contraction causes, respectively, the raising or lowering of the ribs. Besides these are other powerful muscles, which pass obliquely downward and forward from the spinal column to the ribs. Their action is quite simple to understand, for, as they contract, they necessarily exert force upon the ribs. These are the principal muscles employed in ordinary respiratory movement of the chest.

In extraordinary inspiration other muscles are brought into play, those principally employed being the powerful external muscles of the chest and neck, but it is difficult to describe them definitely, as they are most complex in their action.

CHAPTER V.

THE MECHANISM OF RESPIRATION.

In order to understand the act of breathing, it is necessary that we know that the lungs are highly elastic, and have a strong tendency to pull the ribs inward, and pull upward on the diaphragm, thus lifting the abdominal contents. In other words, the lungs attempt to diminish the diameter of the chest in every direction, that is, they attempt to cause expiration; consequently, the muscles of inspiration have to counteract and overcome this ever present contraction. In inspiration therefore, the chest muscles have to work against three factors, (1) the elastic force of the lungs, (2) the elastic force of the abdominal organs in their normal position, and (3) the resistance the ribs offer in their motion.

If the lungs were to be removed from the chest cavity, they would collapse, but during life, even in extreme expiration, they are

always "on the stretch." Undue expansion of the lungs is impossible, on account of the bony framework preventing such an occurrence.

From the foregoing it will be seen therefore, that inspiration is principally active, and expiration passive. Expiration is the snapping back of released springs, the muscles. Since extreme expiration is also brought about through muscular contraction and the bending of ribs, and the chest must be squeezed to less than its average diameter, the chest, on relaxation of the muscles, springs back again to its normal dimensions by virtue of its elasticity. The chest walls, therefore, prevent undue contraction of the lungs as well as undue expansion. The outer surface of the lungs being in close contact with the inner surface of the chest, the degree of contraction and dilation of the lungs is dependent upon the boundary walls of the chest.

The mechanism of the lungs is as that of a bellows in which the inward and outward passages are one. As the chest expands and its diameters become enlarged, a low pressure is formed in the lungs, causing the in-

rush of air; this we term inspiration. When the muscles relax and the ribs are permitted to spring back to their normal position again, a high pressure is formed in the lungs, causing expiration. We note, therefore, that in extreme inspiration there is not a pressure in the lung cells, as is generally supposed.

FORMS OF RESPIRATION.

A large number of muscles being involved in the contraction and expansion of the chest, and, as many of these muscles may act independently, it follows that the mechanical action during respiration changes as different sets of muscles are employed. Consequently we have what is known as "Clavicular Breathing," "Chest Breathing," "Mid-Chest Breathing," "Diaphragmatic Breathing," etc.

Clavicular breathing is that form of breathing wherein the greatest mobility during the act is in the extreme upper section of the chest. This method of breathing is also referred to as "Upper Chest Breathing."

Chest breathing is that form of breathing which brings into action the entire chest, possibly with the greatest expansion in the region of the seventh rib.

In Mid-Chest breathing the lower chest alone responds.

Diaphragmatic breathing derives its name from the fact that in this form of respiration the diaphragm is the source of power that increases the dimension of the chest cavity. As the diaphragm contracts, the vertical diameter of the chest cavity becomes enlarged, thus causing inhalation, and vice versa.

Abdominal breathing is a term often applied to diaphragmatic breathing. In order to avoid confusion I have always refrained from using the term "Abdominal Breathing." My experience in teaching pupils to attain control of the diaphragm has been that in many there is a strong tendency to bring the abdominal muscles into action. By avoiding all mention of the abdomen and abdominal muscles, and by centering the attention on the diaphragm, this tendency is usually counteracted.

RESPIRATORY RHYTHM.

Inhalation and exhalation, under ordinary conditions, require nearly equal time. In women and children, however, inhalation is a little shorter in duration than exhalation, and there is also a slight pause between the end of one exhalation and the beginning of the next inhalation. The duration of inhalation as compared to that of exhalation, is about as 6 is to 7, or 6 is to 8.

DIVISIONS OF RESPIRED AIR.

John Hutchinson defined the various divisions of respired air as follows: "Vital Capacity, Tidal Air, Complemental Air, Reserve Air, and Residual Air."

Respiratory capacity, or vital capacity, is indicated by the quantity of air which a person can expel from his lungs by a forceful expiration after the deepest inspiration that he can make; it expresses the power which a person has of breathing in emergencies necessitated by active exercise, violent effort, and disease.

Tidal air is the quantity of air which is habitually and almost uniformly changed in

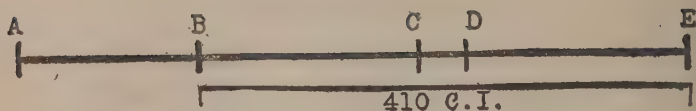


Figure 4.

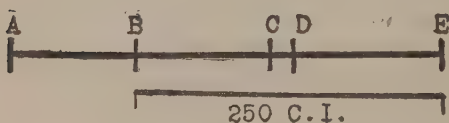


Figure 5.

Figures 4 and 5 show the relative quantity of air contained in the lungs of two persons, one having a lung capacity of 410 cubic inches and the other 250 cubic inches, also the relative amount of air breathed habitually.

C-D represents the breathing air or tidal air, the quantity of air that is habitually exchanged. The amount in this case is about from 30 to 35 cubic inches in Figure 4, and about 20 cubic inches in Figure 5.

D-E represents the complementary air, the quantity that can be inhaled over and above the ordinary inspiration. The quantity is about 190 cubic inches in Figure 4, and 115 cubic inches in Figure 5.

B-C represents the reserve air, the air which can be expelled after an ordinary expiration. The quantity of air exhaled in this manner is about 185 cubic inches in Figure 4, and 115 cubic inches in Figure 5.

A-B represents the residual air, the quantity which remains in the lungs after a most violent expiratory effort. The amount depends in a great measure upon the absolute size of the chest, but is estimated to be from 100 to 200 cubic inches.

each act of breathing. In a healthy adult man, it is about 30 cubic inches, and may reach, in exceptionally large and active-lunged persons, to from 35 to 40 cubic inches. In persons with deficient respiratory power it may drop to as low as 5 to 10 cubic inches.

Complemental air is the quantity over and above tidal air which can be drawn into the lungs in the deepest inspiration.

Reserve air is the term applied to that quantity of air which remains in the lungs after an ordinary expiration, and which may be expelled by a forcible expiration.

Residual air is the quantity which remains in the lungs after a most violent expiratory effort, and cannot, under any condition, be expelled. Its amount depends, in a great measure, upon the absolute size of the chest, and has variously been estimated to be from 100 to 200 cubic inches.

RATE OF RESPIRATION.

The number of respirations in a healthy adult person ranges from fourteen to eighteen per minute. The rate of respiration, in health, usually corresponds to the rate

of heart pulsations as 1 is to 4, or 1 is to 5, though under certain circumstances, especially when the lungs become diseased, this may vary considerably.

Size plays an important role in the rate of respiration. The larger the animal, the slower the respiration, the greatest contrast being noticeable in the rapid breathing of a mouse, and the slow deep respiration of an elephant, who breathes but eight or nine times a minute.

This great difference in the rate of respiration of animals, Hutchinson attributes principally to difference in the loss of heat from the body. The smaller the animal, the greater is the surface exposed to the air as compared to the bulk of the body, and since the warmth of the body is principally dependent upon the respiratory function, the rate of respiration and the functions of all the organs must be far more active in a small animal than in a large one.

I might suggest that it will be found difficult to judge one's own rate of respiration. The best method is to have an assistant note the rate when one is not aware that it is being observed.

FORCE OF RESPIRATION.

Since the force the lungs can exert in exhalation or inhalation gives us no valuable data in the study of the respiratory function, and it being, in most cases, extremely dangerous to make such a test, I shall not dwell on that point, but merely advise never to blow with great effort into devices intended to measure the pressure with which air can be inhaled or exhaled.



CHAPTER VI.

THE CHEMISTRY OF RESPIRATION.

Air consists principally of Oxygen and Nitrogen, and Carbon-Dioxide, the amount of Carbon Dioxide in pure air being extremely low. The proportion of Oxygen and Nitrogen in air, by weight, is Nitrogen 75 parts, and Oxygen 25 parts. In respiration Nitrogen has no chemical value, its function being simply to dilute the Oxygen.

In respiration the blood absorbs about from 20 to 25 per cent. of the Oxygen contained in the air inhaled. At the same time, as the result of the lungs throwing off Carbon Dioxide, a rather smaller quantity of this composition is added to the air as it circulates through the lungs. The quantity of Carbon Dioxide thus exhaled by a healthy adult man, amounts to about eight ounces by weight, every twenty-four hours. This quantity must be considered approximately only, as the amount of Oxygen inhaled and Carbon Dioxide exhaled may vary greatly,

this being the case especially in disease.

One of the principal factors that might affect the percentage of Oxygen absorbed and Carbon Dioxide exhaled, is the manner of respiration. It is evident that, all other conditions being equal, the longer the air is exposed to the lung tissue, and the larger the area of this lung tissue, the greater will be the chemical change, and vice versa. Therefore, if the air is breathed in quick and shallow gasps, comparatively smaller exchange takes place in the lungs than when the air is forced to enter the innermost recesses of the lungs, and compelled to remain in prolonged contact with the membrane.

The activity of the lungs is governed by the demand of the blood for Oxygen, and its disposition to cast off Carbon Dioxide. When the body is at rest, and little nourishment is required, respiration is comparatively feeble; on the other hand, during severe physical exertion the respiratory movement is very pronounced.

Nature has also made the wise provision of permitting the blood to store Oxygen during sleep to meet future requirements. As an instance, if the total quantity of Oxy-

gen absorbed in twenty-four hours be represented by 100, 67 parts are absorbed by night, and 33 parts by day, while similarly 52 parts of Carbon Dioxide are exhaled during the day, and 48 parts during the night.

From the brief description given in the previous chapters, of the respiratory apparatus, it is evident that its mechanism and functions are most complex. While with careful analysis and reasoning, the student may acquire a clear understanding of the subject, yet the fact remains that even physicians have erroneous conceptions of respiration, especially regarding the mechanical action. In order that this treatise may be fully comprehensive, it will be necessary to enter more exhaustively into the discussion of the many phases met with in the subject of respiration.

In conclusion therefore, the functions of all the internal organs are more active in diaphragmatic breathing than when the upper chest method of respiration is employed. Thus diaphragmatic breathing, is one of the most important functions of the body, and if allowed to become feeble, impaired health necessarily results.

CHAPTER VII.

VITAL CAPACITY.

Hutchinson, in his writings, used the term "Vital Capacity," to indicate the volume of air the lungs could inhale or exhale by the chest breathing method through an extreme effort. He applied this term because exhaustive and thorough research proved that the vital powers of the body correspond to the degree of respiratory power, or, in plainer language, the larger the breathing capacity a man has, the greater is his disease resisting power, endurance, and nervous force.

Vital capacity depends principally upon three things: (1) the flexibility of the chest walls; (2) the contractile force of the respiratory muscles; (3) the actual size of the chest. It will not be necessary to discuss the first two factors named, for it must be apparent at once that as the enlargement of the chest cavity is brought about through

the motion of the ribs, which are acted upon by the breathing muscles, the flexibility of the ribs and the actual contractile force of the muscles must be important factors in the expansion of the chest. The third factor mentioned above, namely, the size of the chest, may also be readily understood. It is evident at once that a four-inch expansion of the chest, in a person with a forty-inch chest girth, produces a greater inhalation than a four-inch expansion in a person with a thirty inch chest girth, just as a four inch swing of a large pair of bellows causes a greater rush of air than a four inch movement of a smaller pair of bellows.

The flexibility of the chest walls depends principally (1) on the thickness of the ribs; (2) on the degree of hardness of the ribs; (3) upon the degree of hardness of the cartilages interposed between the ribs and breastbone, and (4) upon the angle at which the ribs are attached to the breastbone and spinal column. These conditions vary greatly according to age, habits, and temperament. Usually in youth the ribs are quite flexible, and the cartilage yielding. In old age the

ribs become more and more ossified, the cartilage harder, until we often meet with cases where the cartilage becomes almost as hard as bone.

Since the flexibility of the chest walls is such an important factor in the power of respiration, I determined some years ago, in my study of the subject, to obtain some definite data regarding this point. Accordingly, I constructed a special instrument for the purpose of measuring the flexibility of the chest walls. I termed the instrument a "Sternometer." This machine was so constructed that it would record, in pounds, the pressure required to depress the chest a given distance. It was the first instrument of its kind constructed, and gave me the data I sought. It was interesting to note the difference in the flexibility of the chest walls in various subjects. Old men were often found to possess more flexibility of the chest than youths of twenty. It was especially gratifying to observe that systematic breathing gymnastics in a few months would greatly increase the flexibility of the chest, even in old men. The student may make some interesting observa-

tions in the difference of flexibility of the chest in persons, by merely placing one hand on the chest and the other on the spinal column of a subject, and compressing the chest. It will be observed that there exists a decided immobility in the chest of a person of the vital temperament, and a more yielding resistance in persons of the motive and mental temperaments.

INVENTION OF THE SPIROMETER.

In the United States of America and England capacity is usually reckoned in cubic inches, whereas in most countries in Europe the decimal system is employed. The principle data we have regarding this subject was given us by Hutchinson. Though some attempts were made a hundred or more years before his time to make accurate measurements of the air exhaled from the lungs, it was not until Hutchinson invented his Spirometer that any satisfactory results were obtained. An idea may be had of Hutchinson's thoroughness in the study of respiration, when it is recalled that he measured the breathing capacity and noted the peculiari-

ties of the respiratory function in over one hundred thousand soldiers of the English army, besides measuring many thousands of women and children.

Hutchinson estimated the chest breathing capacity of the average adult to be from 200 cubic inches to 275 cubic inches, 200 cubic inches in persons of small stature, and 275 cubic inches, in large men with large trunks. The highest recorded was that of a French giant, who could exhale 460 cubic inches.

Data I have gathered during the last twenty years, and derived through measuring the breathing capacity of more than forty thousand subjects, indicates that men of to-day compare favorably with those measured by Hutchinson.

LARGE BREATHING CAPACITY NORMAL.

The fact that the average breathing capacity of civilized man is about 250 cubic inches would indicate conclusively that we are, indeed, a weak lunged race. The average breathing capacity of a normal man should be not less than 300 cubic inches, while

a large man should have at least 400 cubic inches. Although men with normal breathing power are rare, I have met scores who registered far over 400 cubic inches. Since such men had large full chests, excellent chest expansion, possessed robust health and abundant endurance, it is reasonable to assume that they were normally developed, and that the poor weak-lunged being, with but 250 cubic inches capacity, is decidedly abnormal.

The range of expansion of the chest during an enforced inhalation and exhalation is a true indication of the vital capacity. For every cubic inch of air that enters the lungs, there must be a corresponding increase in the dimension of the chest. This increase may be lateral or vertical, according to the method of respiration employed. Physicians and physiculturists the world over recognize this fact, and consequently estimate vital capacity by the degree of the range of the chest during a forced inspiratory and expiratory effort, (chest expansion.) So universal has this practice become that it is used by physicians in charge of the armies and navies of all civilized countries, as well as by life insurance

companies, and in fact wherever it is necessary to determine physical adaptability.

CHEST EXPANSION DIFFICULT TO MEASURE.

As just stated, the expansion of the chest in breathing is a true indication of the volume of air thus respired, but I contend that it is almost impossible to arrive at any definite results by measuring the expansion of the chest. Too many factors that may tend to make one's calculations inaccurate enter into the matter. Most physicians merely place a tape around the subject's chest and request that he take a deep breath. If an expansion of less than three inches is shown, it is assumed that the respiratory action is deficient; if on the other hand, the subject can expand his chest from six to eight inches, he is credited with possessing phenomenal lung power.

PHYSICIANS' METHODS INACCURATE.

I have met scores of physicians with wide experience in such work, but as yet I have not found one that could judge within twenty-five per cent of the correct breathing capacity

by measuring the chest expansion. I have been measured by a number of physicians, and found their method of procedure so crude, that it was a simple matter to deceive them in any manner I wished regarding the true expansion of my chest.

Physical culturists, I have found, are even less capable than physicians, of judging vital capacity. Instead of measuring the chest expansion where it is most apt to indicate the true expansion of the bony frame work, (which would be around the lower chest, about an inch above the lower end of the breast-bone,) they measure the expansion immediately under the arms, where the lungs are smallest, but where the large external muscles of the chest are most prominent. Besides this they employ other means to "cheat the tape," which accounts for the fact that we hear of some strong men having an expansion of from twelve to eighteen inches. If the true facts were known, it would probably be found that their expansion is as low as from one to two inches. I have examined nearly every prominent strong man in the world, and have found this to be true.

Since it requires a thorough knowledge of

anatomy, and of the mechanical action of respiration, to determine vital capacity by means of measuring the chest expansion, I shall not enter into details regarding the matter, especially as the simplest form of spirometer will accurately indicate the breathing capacity.

Perhaps it may seem presumptuous on my part to assail the method employed by leading physicians. The fact remains, however, that my statements are true, the best evidence being that the death rate from Consumption among those who have successfully passed the "chest expansion test," and have been accepted by life insurance companies as being strong-lunged, is but ten per cent. less than the death rate at large. Surely any man of ordinary intelligence could, without a tape measure, just as readily sift out the probable consumptives from those who have strong lungs. I fear that our physicians have fallen into a rut regarding this matter. Hutchinson realized the uselessness of attempting to estimate vital capacity by means of measuring chest expansion, and, as the result, invented the first spirometer, an instrument on the gasometer principle, which accurately recorded breathing capacity. Hundreds of spirometers

are in use, especially by those making a specialty of the study of anthropometry, but as yet the average physician has not learned their value. He has failed to realize that such an instrument is of great importance in his work.



CHAPTER VIII.

NORMAL BREATHING.

Since Nature has made it possible for us to breathe either by increasing the lateral diameter of the chest (chest breathing), or by increasing the vertical dimension (diaphragmatic breathing), the question arises as to which of the two methods is preferable. This question is answered by Nature herself, for we need only observe the respiratory action in a normal man and in animals to learn that, under ordinary conditions, it is intended that we breathe diaphragmatically. It is the manner in which we should breathe day and night. Only when the body demands an enormous activity of the lungs, as would be the case when running swiftly or when engaged in a severe struggle, should the chest method of breathing be employed. Observe a race horse just after having finished a hard race, and it will be noted that his ribs rise and fall with each breath, which corresponds to chest breathing in man. Observe the same horse when at rest, and it

Changes in Dimensions of the Trunk During Different Respiratory Movements

The solid line A. in Figs. 6 and 7, represents the body when the lungs are deflated and the chest contracted.

The solid line B. represents enforced chest inspiration.

The dotted outlines represent the movements of the body during enforced diaphragmatic breathing. The dotted line C. represents exhalation, and the dotted line D., inhalation.

It will be observed that in the male, (Fig. 6) the greatest movement during diaphragmatic breathing is much lower than in woman (Fig. 7). Nature has made this wise provision in woman, in order that she may breathe freely during pregnancy.

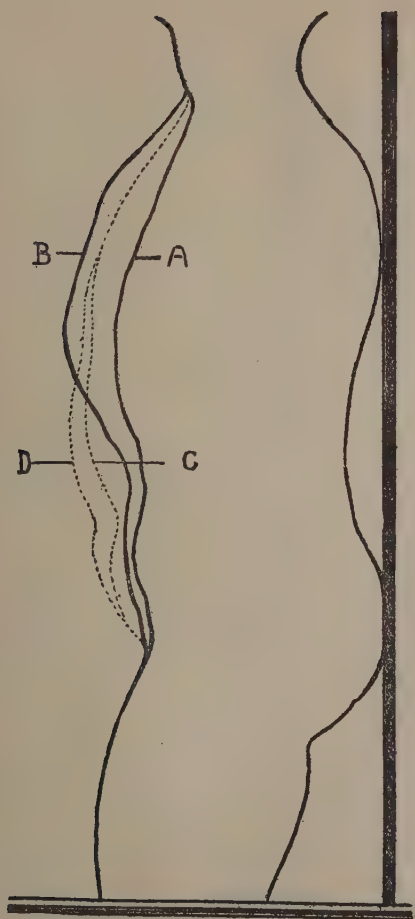


Figure 6.

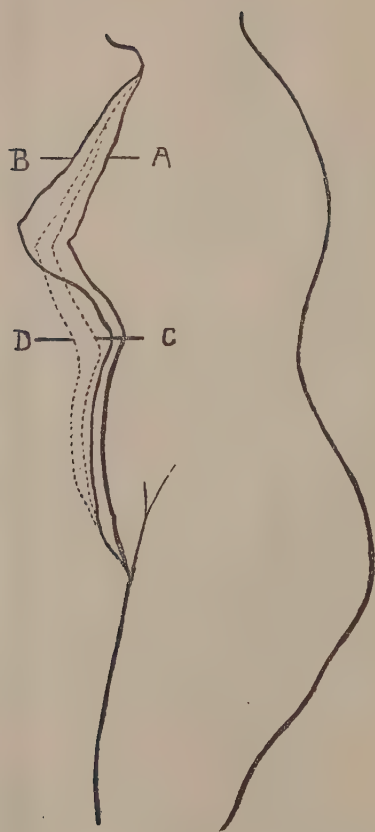


Figure 7.

will be found that merely the abdomen expands and contracts in breathing, or, in other words, he breathes diaphragmatically.

CHEST BREATHING ALSO NORMAL.

The statement that the normal method of respiration during rest is diaphragmatic, must be modified to this extent; careful observation has shown that diaphragmatic breathing is interrupted by deep unconscious chest respirations at intervals varying from once in every minute to once in several minutes. The explanation of this phenomenon is that diaphragmatic breathing does not completely aerate the extreme upper sections of the lungs, thus permitting an excess accumulation of Carbon Dioxide, which the system demands be expelled. Since a deep chest breath accomplishes this expulsion, it follows that Nature comes to the relief at the stated intervals.

It is very essential therefore, that the chest walls be highly elastic, thus readily permitting aeration of the upper section of the lungs. The more restricted the mobility of the chest, or, in other words, the smaller the breathing capacity, the more

difficult it becomes to comply with the demand to aerate the upper lungs, hence persons with very poor breathing capacity may be observed to be constantly gasping for a deep breath. Chest breathing thus is an important factor in the maintenance of health.

ENERGY SAVED IN DIAPHRAGMATIC BREATHING.

As we investigate the phenomenon of diaphragmatic breathing, it becomes evident at once that anatomically and physiologically it is the proper method of respiration. To begin with, in diaphragmatic breathing there is a great economy in the expenditure of both muscular and nervous force, as compared with chest breathing. Chest breathing demands that the enormous resistance of the ribs be overcome in order to increase the dimension of the chest. This requires an expenditure of both muscular and nervous force. In diaphragmatic breathing no bones need be bent, and no heavy layers of muscles need be acted against, as is the case with the external muscles of the chest in chest breathing. In diaphragmatic

breathing the expansion of the lungs is in the direction of the least resistance, namely, the resilient and soft section of the abdomen expands and contracts.

GREATER ABSORPTION OF OXYGEN.

Another important physiological advantage of diaphragmatic breathing is the fact that air inhaled during this method of respiration is exposed to greater area of absorbing tissue than when breathed in any other manner. In chest breathing, the air circulates principally through the upper section of the lungs: in diaphragmatic breathing the air is carried to the lower lobes of the lungs, where the area of the absorbing surface is very extensive, thus giving the blood better opportunity to absorb the Oxygen it requires, and cast off the poisons it has gathered during its circulation through the body. It has been estimated, after careful tests, that a given quantity of air, breathed diaphragmatically, undergoes from 10 to 20 per cent. more chemical change than when confined simply to the upper chest. Diaphragmatic breathing, therefore, may be termed deep breathing. It is true

that during very active chest breathing, more Oxygen may be absorbed, and more Carbon Dioxide thrown off than during diaphragmatic breathing, but the muscular effort is so great that such chest breathing cannot be continued long on account of the lack of endurance of the muscles therein involved. Chest breathing should be employed, therefore, only when, for a short period of time, an enormous exchange of air is needed by the body, or as a form of respiratory gymnastics for broadening and deepening of the chest, broadening of the shoulders, or to produce other anatomical changes.

DIAPHRAGMATIC BREATHING PROMOTES BLOOD CIRCULATION.

If the student will carefully consider the construction of the chest and lungs, and the physical laws governing respiration, he must at once see that breathing causes a decided activity of the trunk. As shown in a previous chapter, the inrush of air to the lungs (inhalation), is caused by the low area of pressure within the chest cavity, as a result of the chest cavity being en-

larged. During exhalation a high pressure is formed in the chest cavity. Since there is a very free circulation of blood within the lung tissue and chest cavity in general, it follows that when a low pressure is suddenly formed within the chest, there is a rush of blood as well as a rush of air to the lungs. On the other hand, during exhalation, when there is a high pressure formed in the chest cavity, blood is forced from the lungs. It is evident, therefore, that in breathing there is a constant forced circulation of blood to and from the lungs and chest cavity, which corresponds with the force of the respiratory effort.

MASSAGE OF THE VITAL ORGANS.

Besides this forced circulation, there is also a tendency to impart motion and pressure to the abdominal organs. This tendency is greatest in diaphragmatic breathing, and least in the upper chest method of respiration.

The accompanying illustration may give the student a better conception of the mechanical effect of diaphragmatic breathing upon the various organs. As will be noted

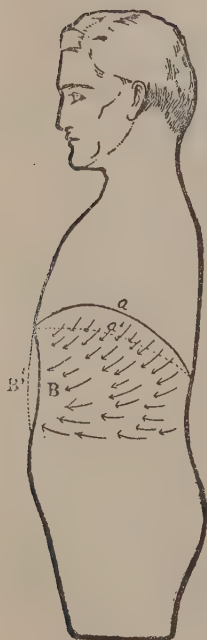


Figure 8

The accompanying diagram describes the mechanical action of the trunk during diaphragmatic respiration. *a* and *a'* represent the diaphragm, the muscle that separates the lungs and heart from the abdominal organs. During diaphragmatic breathing this muscle contracts and relaxes, causing it to move up and down, as shown, thus causing a corresponding movement of all the abdominal organs, as shown by the arrows. During inhalation the diaphragm descends to *a'*, causing the abdomen to expand to *B'*. During exhalation the diaphragm ascends, causing the abdomen to contract, *B*.

in the diagram, the diaphragm acts as a partition between the lungs and heart above, and the abdominal organs below. In diaphragmatic breathing, this muscle, the diaphragm, ascends and descends, the descent being caused by the contraction of the muscle, and the ascent as the result of its relaxation. The stomach, liver, and intestines lie immediately below and adjacent to the diaphragm, and it follows that during the "excursion" of the diaphragm a corresponding activity is imparted to these organs. By virtue of the fact that during inhalation the diaphragm forces the abdomen to expand, it follows that a high pressure is produced in the abdominal region during inhalation, which decreases again during exhalation. Diaphragmatic breathing, therefore, besides economizing in the expenditure of muscular power, and producing more extensive aeration of the blood, assists most energetically, (1) the circulation of the blood in the lungs and bronchial tubes: (2) the circulation of blood in the abdominal cavity, that is, in the stomach, liver, intestines, etc.: (3) it imparts motion to, and kneads and massages the abdominal organs.

CHAPTER IX.

THE IMPORTANCE OF A LARGE CHEST.

The size of the chest cavity is an important factor in the degree of vitality of the human animal. All other things being equal, the larger the chest, the greater is the vital power. As shown in a previous chapter, the larger the chest, the greater is the breathing capacity, provided the action of the chest is not restricted. In diaphragmatic breathing a large chest offers a decided mechanical advantage. The action of the diaphragm in diaphragmatic breathing may be compared to that of a piston of a pump. As may be perceived at once, with the same stroke, a pump of large diameter has a greater capacity than a pump of a smaller diameter. Similarly, an "excursion" of two inches of the diaphragm in a large chest, must cause more air to enter and leave the lungs, than a two inch movement in a smaller chest.

Another decided value of a large chest is the fact that the heart can perform its func-

tion with greater freedom of action. Nothing is more dangerous than restricting the motion of the heart, which condition is so often found in flat-chested persons. Death occurs through the heart being impeded in its action, as a result of distention of the stomach.

LARGE CHEST MEANS LARGE LUNG AREA.

The principal value of a large chest over a small one is that the chemical changes within the lungs are far more active. This phenomenon is due principally to two conditions: (1) The larger the chest, the greater is the area of the tissues within the lungs exposed to the aerating medium, air. In small lungs this area may not exceed 1,000 square feet, whereas in large lungs it has been estimated to be nearly 2,000 square feet. This vast difference in the area exposed to respired air must necessarily have a corresponding influence upon the condition of the blood; (2) The air cells of the lungs are always in a semi-inflated state. After the most pronounced expiratory effort, there remains a certain volume of air in the lung cells known as "residual air" (see page 35). In a large chest the volume of residual air

may be as much as 250 cubic inches, and in a small chest, far less than 100 cubic inches. This residual air is an important factor in the respiratory function, for the reason that it is stored air, thus making it possible for the blood to carry on the process of exchange continually. Respiration means a discharge of a small part of this stored air, and a return of a corresponding supply of pure air. The greater the volume of stored air, the longer may breathing be suspended without seriously affecting the condition of the blood. Perhaps the important function of residual air within the lungs may be better understood when it is recalled, that as a rule, the heart beats four times to every complete inhalation and exhalation—therefore, if there did not exist a certain quantity of stored air in the lungs, it is evident that large volumes of blood would be compelled to pass through the blood vessels of the lungs without having had an opportunity to be aerated.

One of the greatest errors met with in the study of lung action, is that of assuming that a large chest is an infallible indication of good breathing power. It is overlooked that it is the mobility of the chest walls that determines

the capacity of the lungs, and not the actual size of the lungs. A man with a 34 inch chest, but with a great chest expansion, may have greater breathing capacity than another man with a 50 inch chest, but with comparatively small expansion. In my practice this fact has been brought to my notice a number of times. As an instance I shall cite the case of a physician who called on me some years ago. At first glance I noted that he was a powerfully built man. As I entered into conversation with him, I learned that he was perhaps the strongest amateur athlete I had ever met. His chest measured 50 inches, and the muscles of his arms and legs were phenomenally developed. He was the "star" pupil of a celebrated instructor in New York City.

After conversing with the physician, I suggested that perhaps his breathing power was not as great as he believed it to be. He acknowledged that he had never tested his respiratory power with a spirometer, or **Pneumauxetor**,* but stated that he had excellent chest expansion, and had been assured by his

*An improved form of spirometer devised by the author.

teacher that he had comparatively as great breathing power as muscular power.

I failed to agree with him in this respect, and after testing the flexibility of his chest walls by placing him against the wall and pressing against different sections of the chest, I expressed the opinion that his breathing capacity was quite small, and to convince him, I requested that he measure the same with an instrument I had at hand. Before he made the test, I asserted that his capacity was not over 200 cubic inches, or less than half what it should have been. This statement was met with derision, but a test opened his eyes. His highest record was but 180 cubic inches. It is needless to say that he was dumbfounded, especially after I called in a young lady, an assistant in my office, and had her make a record of 260 cubic inches. The physician became a pupil of mine, and developed a capacity of 360 cubic inches.

STRONG MEN USUALLY POOR BREATHERS.

This is but one of many similar cases. I have tested the breathing capacity of several of the world's greatest strong men having

enormous chests, and found that they had phenomenally low breathing capacity.

If the mobility of the chest walls, and the contractile force of the breathing muscles is to be maintained, it is necessary to exercise the breathing apparatus systematically. Neglecting to do so leads to early ossification of the chest walls and cartilages, and atrophy of the breathing muscles, regardless as to whether the chest measures 30 inches or 50 inches in circumference.

Another important point it is well to bear in mind, is that a large chest, while indicative of large lungs, by no means insures healthy lung tissue. The lung tissue, in order that it may possess great absorptive power, and be immune to intruding germs, must come in contact with abundant pure air, as is the case in deep breathing. A remarkable case was brought to my notice some years ago, that fully verified the truth of this statement. There came to consult me one day in my office, a man who, from all outward appearance, was a type of perfect health. He was a full-blooded North American Indian, about six feet three inches in stature, and of excellent physical proportions. Mentioning the

object of his visit, he stated that he was a consumptive. He had had his sputum examined by the Board of Health, who found bacteriological evidence of Tuberculosis.

I tested his breathing capacity and found, to my surprise, that it exceeded 400 cubic inches. The fact that a man with such splendid lung development should have Tuberculosis interested me greatly, and upon further investigation, I learned that his decline was due to simple neglect of his health, or, as he expressed it, "I stayed up all night to see that nothing happened to New York."

Fortunately this son of Nature was only in the first stage of the disease, and realized the uselessness of drugging himself in the endeavor to regain his health. To-day he is completely cured, and has a breathing capacity of about 450 cubic inches, which, with one exception, is the highest record ever brought to my notice.

With the foregoing case as an example, we may readily see that a large chest and great breathing capacity, are by no means an insurance against disease. In order that the lung tissue may be immune to germs, it is absolutely necessary that the lungs be actively exercised.

CHAPTER X.

BREATHING: ITS INFLUENCE UPON HEALTH.

The act of breathing is a function of such vital importance in the maintenance of life, that it may readily be understood that if this function were to be permitted to deteriorate, serious manifestations of illness, physical depression, and weakness must follow. The human body is such an intricate and complex organization that it would be impractical, in this treatise, to attempt to describe the many ways in which deficient activity of the lungs may interfere with the perfect balance of the functions of the various vital organs, and to attempt to show how such disturbances may be the direct and indirect cause of many chronic and acute ailments. In the chapters that follow, the influence of breathing upon our health will be discussed briefly and conservatively. I shall avoid the great danger of being an extremist in my faith in the curative powers of breathing gymnastics, although I could not

be condemned severely were I to make the claim that every ailment known to mankind is due mainly to deficient respiratory action, for it would be most difficult to present facts to combat such a theory. Experience has taught me that it is dangerous to become an extremist. The folly of riding some pet hobby or fad to death, is being demonstrated every day. We have among us dietetists who attribute every weakness that may befall man to improper diet, whether he breathes fully or not. Many physical culturists claim that lack of physical exercise is the sole cause of all physical weakness. Others claim that it is not the food we eat that determines our physical condition, but rather the manner in which we eat it. Some believe that the retention of waste matter in the bowels is the cause of every ailment, from the falling out of the hair to chilblains. Thus I might continue to cite examples of extremism and the follies preached by the advocates of certain hygienic measures. In view of the fact that many an important and excellent hygienic principle has been brought into disrepute and public ridicule through the over-enthusiasm of its disciples, I feel that I can-

not be too conservative in discussing the importance of proper breathing.

Since the chief function of respiration is to nourish and purify the blood, it follows that shallow breathing may lead to innumerable diseases and chronic ailments. Blood is composed in part of white corpuscles, a true animal cell. These cells are termed the "Warrior Germs" of the body. It is their duty to destroy any intruding disease germs that may enter the blood, and thus prevent the disease from gaining the upper hand, and ultimately leading to death. The disease resisting power of the body, therefore, depends upon the strength and number of the "Warrior Germs." The oxygenation of the blood being one of the principle factors in the maintenance of a strong army of warrior germs, it follows that shallow breathing necessarily must lower the disease resisting power of the body. Therefore, if we are to be immune to disease, it is necessary that we breathe fully and deeply.



CHAPTER XI.

“ CONSUMPTION ”

Civilization has at last awakened to the fact that it is face to face with a terrible plague—a plague that is more destructive to life than all the wars in history, far more destructive than Cholera, Black Plague, and Yellow Fever. I refer to the terrible disease technically known as Tuberculosis of the Lungs, and commonly known as Consumption.

Consumption is a germ disease, caused by the ravages of the Tubercular Bacilli. When these terrible germs find their way into the lungs of some unfortunate being whose blood is deficient in warrior germs, they rapidly multiply and inch by inch devour the lungs. The result is a slow and lingering death. Unlike Diptheria and some other germ diseases, no anti-toxin has thus far been found that is of any avail. Once the disease has assailed its victim, it evolves itself simply into a question of which is the stronger of the two, the vitality of the patient to overcome

the germ, or the strength of the germ to overcome the vitality of the patient. The only course open, therefore, is to assist Nature by strengthening the vital powers through proper diet, light exercise, deep breathing, and fresh air. Herein lies the only hope of vanquishing the disease.

The medical profession, in general, in its endeavor to combat the plague, assumes that the most important step is to rid the world of the germ. I claim that any attempt made to completely eradicate any germ is futile. The smaller the life the more difficult it is to destroy it. It would be a far simpler task to destroy every elephant and other large animal on earth than to destroy the mosquitoes in one small swamp, and it is still far more difficult to exterminate an invisible foe that exists in countless billions, and multiplies itself with rapidity that is beyond conception, as does a Tubercular Bacillus. Reason tells us that the only logical course is to make our bodies untenable to the germs.

Consumption is not a disease that attacks the strong and healthy—it is essentially a

weakling's disease. Any person in ordinary health, should he contract the disease, can throw it off with ease. This is proved by the fact that post-mortem examinations made on thousands of cadavers show that nearly every person some time during his life, has had his lungs attacked by Tubercular Bacilli, but through his inherent disease resisting ability, has been able to throw off the germ. The prevention of Consumption, therefore, is simply a manner of keeping the vital powers in a high state of health.

CONSUMPTION IS CURABLE.

Consumption is curable. This is an unquestionable fact. Not many years ago it was believed that one afflicted with Consumption was condemned to death. To-day, if the disease is detected early and treated properly, not one case in ten is fatal. While the methods employed in the cure of Consumption differ, the fundamental principle of every cure consists in the building up of the vital powers through various hygienic measures. Dieting has been found of great value. Patients are fed with enormous quantities of rich food. This method is very

effective, provided the digestive functions of the patient are in excellent condition, but when this "stuffing cure" is applied to chronic dyspeptics, it naturally proves a failure. Removing patients to high altitudes has proved very efficacious, and is probably advocated more often than any other treatment.

BREATHING CURE IN TUBERCULOSIS.

This brings me to the discussion of the employment of deep breathing as a cure for Tuberculosis. My experience has been that systematic breathing gymnastics is by far the most effective and rapid cure for Consumption. It is true that some physicians advocate perfect rest for the lungs, but I cannot agree with this theory. I claim that the only benefit derived by a patient when removed to a high altitude, is due to the fact that the rare condition of the air compels him to breathe deeply, and that there does not exist some marvelous remedial agent in the air. Living in high altitudes simply gives the lungs the exercise they so imperatively need. A patient must breathe

deeply and rapidly in order to get enough Oxygen to keep alive. He is forced, both day and night, to breathe deeply, whether he wishes to do so or not. The lungs require activity, so that the blood may circulate freely through the attacked sections, in order that the "Warrior Germs" may be given an opportunity to meet their foes, the Tubercular Bacilli. Furthermore, pure air, especially air that has been cleansed by sunlight, is the greatest enemy of disease. It should be the aim to compel the diseased sections of the lungs to come in contact with, and be exposed to, this cleansed air.

My views upon this matter are not based upon mere theory. I have had under my care and have cured scores of Consumptives. In order to be sure that there might be no error, I had their sputum examined by the Board of Health. If the disease had not advanced far, in a few months all signs of Tubercular Bacilli disappeared, and in due time a complete recovery resulted. The only thing that has deterred me from proclaiming aloud that I positively can cure Consumption through deep breathing, is the fact, that, as a rule, a patient does not

acknowledge that he has Consumption until he has reached the last stage of the disease, and the possibility of recovery is doubtful.

Some years ago I let it be known that I would accept consumptives as patients. I was flooded with applicants who were on the verge of collapse, and was compelled to recall the offer. I found that I would have my hands full dealing with consumptives who were not aware of having the disease, but instead believed themselves to have a severe cold that had settled on their lungs. In connection with this let me state that a Cold is a disease, which, like many other diseases, "runs its course." If coughing from the lungs continues for weeks after the first attack, there is every indication of grave trouble, with a probability of Tuberculosis, and immediate steps should be taken to develop the disease resisting powers of the blood.

The proper treatment in a case of Tuberculosis may be summed up in the two words, Live Hygienically. Avoid all mental strain, sleep from eight to ten hours daily, and eat as much nourishing food as the digestive organs can care for and thor-

oroughly masticate. Eat whatever food agrees best. There is no one regime of diet especially adaptable to every one. Take a little light exercise daily. Avoid cold baths, but bathe the chest with cold water twice daily. Take slow walks in the open air daily. Do not be afraid of night air, but sleep in a well-ventilated room, even when the temperature is below zero. Keep in the sunshine as much as possible. Last, but not least, practice deep breathing. If it is known which section of the lungs is affected, center the attention upon that region. Place the fingers over the diseased section, and, when breathing deeply, try to cause the greatest expansion in that region. Diaphragmatic breathing should be practiced faithfully while in a reclined position. A consumptive should devote his entire time to fighting the disease. All thoughts of business and other duties should be dispelled. It is useless to attempt to rebuild the vital forces while under the strain of business or other worries. If the foregoing advice be followed faithfully, full recovery may be expected in a few months, provided the disease has not been allowed to go too far.

CHAPTER XII.

PNEUMONIA AND COLDS.

Pneumonia is the most widespread and fatal of all acute diseases. As a destroyer of life it is second and almost equal to Consumption. In large cities the death rate from Pneumonia is greater than that from Consumption, and careful statistics kept for the last fifty years, show that the disease is constantly increasing.

The mortality ranges from 20 to 40 per cent. It is especially fatal in persons beyond the age of fifty years, the death rate being as high as from 60 to 80 per cent. It is a disease that strikes its victim suddenly, and ends either in death or recovery within a few days. Pneumonia, unlike Consumption, does not find its victim principally among the lower classes, but it is a disease that strikes the rich and poor alike. Any one whose physical condition permits him to contract a Cold is exposed to Pneumonia.

No advance has been made within the last fifty years in the treatment of Pneumonia.

Some writers claim that the mortality to-day is greater than fifty years ago, and efforts are being made to learn if this is due to the modern method of treatment. Thus far, however, no definite decision has been derived regarding this point. Medicine has proved of absolutely no avail. Recent experiments have been made with the open air treatment, and the results in every instance have been most satisfactory. In many hospitals Pneumonia patients are kept in the open air, regardless of the state of the weather or temperature.

It is needless to enter here into the symptoms and treatment of Pneumonia, as no practical advice could be given. It is in the prevention of the disease, rather than in the cure that we should be mostly interested. We face the fact that Consumption, Pneumonia, Bronchial troubles, and other diseases of the lungs, destroy about one-third of the human race, and that Pneumonia is by far the disease to be most dreaded. Consumption, as has been stated previously, can readily be thrown off by any one with average vitality. It is a disease that is fatal only when neglected or

when contracted by the very weak. Pneumonia, on the other hand, attacks the strong and apparently healthy. The broad shouldered, ruddy-faced, well fed and well cared for banker or statesman is just as likely to contract Pneumonia as is the homeless pauper. In the winter not a week passes that some man of prominence and great value to the country does not die of the disease. It strikes the successful men of the world.

THE DANGER OF COLDS.

Pneumonia being a disease of the lungs, it follows that if we keep the lung tissue in a high degree of health, it is impossible of contraction. Pneumonia germs cannot propagate in healthy lung tissue. Few realize the real danger that lurks in what is commonly termed a "Cold." The affection is so universal that we have learned to look upon it as unpreventable and not indicative of any serious derangement. The fact is, however, that what we term a "Cold" actually is the first stage of a disease of serious nature. Consumption, Pneumonia, Bronchitis, chronic Catarrh, Asthma, and other diseases of the respiratory tracts

are usually preceded by, and owe their source to, a Cold.

A Cold is an acute catarrhal inflammation of the upper air passages. If the bronchial tubes and lungs are in a state of health, the inflammation confines itself to these passages, and after running its course, the inflammation ceases, and the Cold disappears. If, on the other hand, the bronchials and lung tissue are in deteriorated condition, as the result of shallow breathing, the inflammation may extend to the bronchial tubes and thence to the lungs themselves. It is only when the lungs are inflamed that Tubercular Bacilli and Pneumonia germs may grasp the opportunity to fasten themselves upon the delicate membranes and begin their work.

Another point to remember is that simply an acute Cold should not last more than three or four days. If a Cold "hangs on" for weeks, accompanied by coughing, there is every reason to believe that the inflammation has extended to the lungs, and that there is danger of Tuberculosis. A physician should be consulted immediately in such instances.

Repeated attacks of Colds ultimately lead to chronic affections of the breathing tracts, the most common disorder met with being Chronic Catarrh. In Chronic Catarrh there is a constant discharge of mucous from the nose, and dropping back of mucous to the throat. The voice becomes nasal in quality, and in advanced cases the Eustachian tubes become obstructed, deafness resulting. Most cases of deafness originate in Chronic Catarrh, and consequently many a case of deafness has been cured by restoring the upper breathing tracts to normal health. Repeated Colds also result in various forms of Laryngitis, Bronchitis, Asthma, and Hay Fever. There may be constant raising of phlegm, especially in the morning upon arising, shortness of breath, and in some cases, a continuous irritation in the throat.

When these affections become chronic, no medical treatment known to science is of any avail. Among my patients have been wealthy persons who had spent fortunes uselessly in both America and Europe for treatments for Asthma, Chronic Bronchitis, and other affections of the respiratory tracts, only to learn that the only positive cure con-

sists in striking at the seat of the trouble—improper breathing. Full active breathing through the nose re-establishes the circulation in the delicate membranes of the respiratory tracts, and the contact of abundant pure air with these membranes restores them to normal health in due time. Vapor inhalations and sprays of medicaments, especially in severe cases of Catarrh, are of decided value in assisting Nature to restore diseased membranes to a normal condition, and should be used faithfully in conjunction with the breathing cure. Some hygienists, who believe it a crime to advocate the use of medicine in any form, recommend snuffing hot salt solutions into the nostrils, but I am convinced that antiseptic solutions especially prepared for nose spraying purposes, are far superior to salt solutions.

THE PREVENTION OF COLDS.

From the foregoing it is evident that what is commonly termed a Cold, is the prime cause of many dangerous diseases and most annoying ailments. Common sense, therefore, tells us that the most rational thing

to do, if we desire to be immune to Consumption and Pneumonia, and be free from the many distressing affections of the respiratory tracts, is to avoid contracting Colds. This can be done only if we breathe fully and correctly. To be immune to Colds it is necessary to have well oxygenated and warm blood. The membranes of the breathing tracts must be well nourished with blood in order that any intruding germs may be instantly destroyed. A Cold is a disease, and should be so considered, and not as being a natural phenomenon occurring in health. An absolutely healthy person cannot contract a Cold, and need not be a "draught dodger." I might cite innumerable instances as a proof of this statement. I have records of thousands of chronic cold catchers who were made immune through deep breathing. One of the most startling revelations that comes as the reward for practicing breathing systematically, is the freedom from Colds. I, too, at one time, although possessor of great physical strength, and enjoying what I believed to be perfect health, was an inveterate contractor of Colds.

CHAPTER XIII.

BODILY GROWTH AND POISE.

At birth, and even before birth, Nature sets a limit to which the body may be developed as regards stature, size of bone, and muscle. Nothing we may do can make it possible to pass this limit, but unless every hygienic law be observed the body will fall far short of reaching full development. Systematic breathing gymnastics are of the highest importance in producing normal development. If in childhood the breathing organs are permitted to deteriorate, or the air passages allowed to become restricted, growth necessarily is retarded. Fortunately this important point is being given more and more attention in our schools. The children in many schools are examined with the view of determining whether the upper air passages are quite free. Records show that the majority of children suffer from adenoids, thus preventing free nose breathing.

When such growths are removed by an operation, it invariably follows that a decided improvement takes place in the physical development.

SYSTEMATIC TRAINING IN SCHOOLS.

I have for years been an ardent advocate of systematic breathing gymnastics in our public schools. It is true that in most schools the children are compelled to practice deep breathing, but nevertheless little real good is being accomplished. The proper course would be to keep a careful record of the breathing capacity of each child. Systematic breathing gymnastics should be practiced daily, and the greatest stress should be laid upon the importance of strict nose breathing. If the breathing capacity of any child should, for any reason, not improve normally, that child should be given special attention. It is most gratifying to remark that a number of the schools of this country have adopted my system of breathing gymnastics, and are now keeping care-

ful records of the growth of the respiratory function in children. The records submitted to me regularly by the school boards bear evidence of the remarkable progress made by the pupils, not only in breathing capacity, but also in stature and weight. The average increase in breathing capacity yearly in children varies from 10 to 12 cubic inches. A report from the Homewood Division of the Pittsburgh, Pa., Schools, shows that 891 pupils in various grades gained on an average 11.88 cubic inches in less than six months. This indicated that the lung development as the result of systematic breathing gymnastics was more than double that of the usual growth in children. This improvement is remarkable in view of the fact that but little attention could be given each child. If every school were to adopt an efficient system of breathing gymnastics, and keep a careful record of the progress of each pupil, it would be but a question of time before Tuberculosis and other diseases of the lungs would be rare. I believe herein lies the real secret to success in any attempt made to stamp out this great evil.

POISE.

Breathing is of great value in producing proper poise of the body. The development of the chest, as the result of breathing gymnastics, naturally gives proper poise and increased width to the shoulders. A flat, undeveloped chest is generally accompanied by round shoulders, drooping carriage of the head, in fact the entire body is thrown out of its proper center of gravity, thus causing a most ungraceful poise, and a faltering and lax gait.

SHOULDER BRACES WORTHLESS.

Shoulder braces, bandages, and other torture devices, are often recommended to prevent drooping shoulders and other abnormalities. I condemn all such appliances not only as being of no practical value, but as being absolutely harmful. Common sense tells us that if our body is deformed as the result of certain groups of muscles having become too weak to keep it in proper position, the best course to pursue is to strengthen these muscles. Shoulder braces do quite the opposite ; instead of strengthen-

ing the weak muscles they tend to weaken them still more. It is a well known law of Nature that if any muscle or organ be permitted to fall into disuse, gradually it becomes weaker and weaker. As an example may be mentioned the muscles of the ears, which have become deteriorated through disuse. If the arm be placed in a sling for many months, the muscles would become so weak that it would be almost impossible to lift it. The same is true in reference to the muscles that have, by Nature, been intended to keep the shoulders in proper position. Placing the shoulders in a sling, as it were, weakens the muscles that are already too weak. Another claim made for such bandages is that they promote deep breathing. Such a claim is preposterous. A simple test with either a spirometer or a Pneumauxetor proves at once, that any form of bandage restricts breathing. Tests I have made showed that in every case there was a decrease of from 20 to 50 cu. in. in breathing capacity when such appliances were worn. There is no short cut to success—no “act-while-you-sleep system” of lung and poise development.

CHAPTER XIV.

THE HEART.

Inasmuch as that wonderful quadruple pump, the heart, is enclosed with the lungs in the chest cavity, and since both act more or less in rhythm, it may readily be understood that if the action of the lungs be feeble, the heart must suffer accordingly. It would be difficult to conceive a condition that would permit a strong and snappy heart action in conjunction with feeble respiration. Reasoning further, we naturally must conclude that if the action of the heart is not normal, breathing gymnastics should have a highly beneficial influence.

THE SPHYGMOGRAPH.

In my early experiments bearing upon the influence of breathing gymnastics upon the heart action, I employed a Sphygmograph, a delicate instrument that is clamped to the wrist in such a manner that the pulsation of the radial artery is transmitted to a minute

SPHYGMOGRAPHIC TRACINGS



Figure 10

Blood waves of a normal subject.



Figure 11

Tracings of the blood waves of a Consumptive.



Figure 12

An example of peculiarities met with in the study of Sphygmographic tracings.



Figure 13



Figure 14

Figures 13 and 14 are tracings of the same subject. The second tracing gives evidence of the remarkable improvement brought about in the action of the heart through three months' practice of deep breathing, combined with proper exercise.



THE SPHYGMOGRAPH

lever, which, in turn, through an ingenious mechanical arrangement, records its movement on a strip of paper. I shall not attempt here to enter deeply into the phenomena of the action of the heart valves or the blood waves that occur in the arteries. A casual inspection however, of the diagrams here shown should prove interesting, and give a conception of the manner in which the Sphygmograph records the blood waves. Fig. 10 represents a Sphygmographic tracing of the blood waves in a normal subject. The upstroke (a), represents the sudden injection of blood into the arteries. The downstroke, (b) is less abrupt, and represents the recovery of the arteries as the blood is forced along in its circulation. The secondary waves that occur in the downward stroke would be difficult to explain to the layman.

Using the tracing of a strong and normal heart action as a basis for comparison, the tracings showing the abnormal conditions frequently met with, readily give a conception of the difference that may exist in the heart action, not alone as regards the force of the pulsations, but also their character.

The Sphygmograph thus offered a valuable

aid in determining the effect of breathing upon the action of the heart. Hundreds of tracings I have made of pupils showed that, in practically every instance, an increase in the action of the lungs produced a corresponding improvement in the action of the heart. Not only was such improvement manifested by a stronger, more regular heart action, but, as a rule, the action of the valves of the heart showed a decided improvement.

That the heart requires ample freedom of action, is well known. This is obviously proved by the fact that when the heart is impeded in its action through too heavy deposits of fat, or as the result of extreme dilation of the stomach, after a heavy meal, sudden death often results.

To improve the action of the heart, therefore, the first step should be to give it greater freedom by increasing the size of the chest cavity through persistent breathing gymnastics.

CHAPTER XV.

INTERNAL EXERCISE.

Breathing offers a form of internal exercise that is of the greatest physiological import. As shown in a previous chapter, both during chest and diaphragmatic breathing there is an alternate high and low pressure throughout the lung area, which is an important factor in the circulation of the blood in that region. In diaphragmatic breathing a similar alternate pressure occurs in the abdominal cavity, which vigorously stimulates the circulation of the blood in the abdominal organs. Furthermore, the excursion of the diaphragm imparts to the abdominal organs motion, which, in a sense, is a form of massage and exercise. During forced chest breathing, there is also a decided activity of the entire abdominal contents. The motion and stimulation thus produced through breathing gymnastics I term "Internal Exercise," to differentiate from other forms, which I prefer to term "External Exercise," since the latter tend

especially to reach the external groups of muscles, rather than the internal organs.

The effect of internal exercise in promoting the functions of the various vital organs, becomes apparent at once when we consider the relative position of the organs with the muscles of respiration, and also the mechanical action of respiration.

Lying directly above the diaphragm, are the lungs and heart. Directly below the diaphragm lie the stomach, liver, intestines, and other organs concerned in the digestion, absorption, and elimination of food. During an enforced chest inhalation, the abdomen is contracted and the entire abdominal contents raised. Again, during exhalation, as the chest contracts, the abdominal organs are lowered. While this extended motion of the organs takes place, there is an extraordinary circulation of the blood produced within the trunk, which unquestionably must promote the functional activity of the organs.

In forced diaphragmatic breathing similar motion is imparted to the organs, only not to such a great degree. The Internal Exercise thus brought about through forced

breathing is of the highest value in restoring the functional power of the vital organs. The great advantage therein lies in the fact that it reaches the vital organs directly, whereas in usual forms of exercise, such as bending and twisting of the trunk, horse-back riding, walking, etc., motion is imparted to the vital organs rather indirectly.

MASSAGE INDIRECT TREATMENT.

Massage, even when administered by an expert, is, at best, indirect as compared to forced breathing. The liver, a great gland lying directly beneath and adjacent to the diaphragm, is especially massaged in forced breathing, and as this organ is one of the most important concerned in digestion, it follows that internal exercise promotes the process as can no other form. During activity of the diaphragm, the stomach is also massaged and assisted in performing its function.

It is particularly in the elimination of waste matter from the bowels that the massage produced by breathing is of importance. In order that the millions of glands

concerned in the excretion of fluids so essential in the promotion of the activity of the bowels may best perform their functions, motion is absolutely necessary. If the abdominal region is not granted this motion, and massage, there can be but one result—CONSTIPATION.

Internal Exercise may therefore be employed with remarkable results in the cure of disorders of the abdominal organs. There are few conditions that are not greatly benefitted simply through breathing. Thus deep breathing may, in a comparatively short time, relieve the most obstinate cases of **Constipation, Indigestion, Billiousness, Liver Trouble, Gall Stones, Intestinal Catarrh, Catarrh of the Stomach, etc.** Kidney and Bladder troubles and Appendicitis are the few affections that do not readily respond to internal exercise. It appears that when the appendix reaches such a stage that it has a tendency to become diseased, it responds but slightly to any attempt made to restore it to a normal condition.

The special value of "Internal Exercise" as a therapeutic agent is the fact that it offers a means of thoroughly exercising and

stirring up the vital machinery without the necessity of great expenditure of physical force. The weakest woman is never so weak that she cannot thoroughly stir up her internal body through deep breathing, whereas it would require considerable physical exercise to give the vital machinery the required amount of activity. Few people, unless they be in excellent condition, have the muscular strength and endurance to exercise vigorously enough to reach and stimulate the internal organs as required.



CHAPTER XVI.

GENERAL BENEFITS OF BREATHING.

The ailments and conditions that respond directly to systematic breathing gymnastics are too numerous to mention. They include practically every ailment that is due to impoverished blood and poor circulation, and, as may be surmised, these are many. The human body may appropriately be compared to a delicate piece of machinery, and just as every piece of machinery has some particular part that is comparatively weaker than any other, and under severe strain would be the first to break, so every human body has some weak part. We are born with certain organs, muscles, and tissues comparatively strong or weak. In one it may be the lungs, in another the heart, in another the stomach, liver, nervous system, the muscular system, or any other part of the human anatomy. It follows, therefore, that if we neglect the breathing function, thus permitting our blood to become impoverished

and stored with waste matter, the warning signal will be manifested by some disorder. If the weak part of the body happens to be the lungs, or bronchials, the result may be Asthma, Bronchitis, Pneumonia, or Consumption. If the nervous system should happen to be the weak point, shallow breathing may lead to any of the numerous nervous disorders.

INDIGESTION.

If the stomach be weak, Indigestion would naturally result. Thus scores of different disorders may result from shallow breathing, which the casual observer would not attribute to such cause, and would attempt to correct by other means than the strengthening of the breathing function.

CONSTITUTIONAL DISORDERS.

All constitutional disorders, such as Rheumatism, Gout, Diabetes, Rickets, and Obesity, respond rapidly to deep breathing, as do also abdominal disorders. The increase in circulation and the improvement in quality of the blood supplied to the ab-

dominal organs, stimulates the function of all organs concerned in the digestion, elimination and absorption of food. Especially is breathing valuable in the cure of various forms of Liver troubles. As stated previously, all diseases of the respiratory tracts, Asthma, Hay Fever, Catarrh, and Bronchitis respond only to breathing. It is self-evident that all disorders due to retention of poison in the blood, such as skin eruptions, Headaches, etc., are reached most effectively through proper respiration.

MUSCLE GROWTH.

Breathing is an important factor in the growth of muscle. Many an athlete who apparently had reached the limit of his muscular development, has found, that upon better oxygenation of the blood, as the result of more active breathing, his muscular growth was renewed with vigor.

BLOOD CIRCULATION.

Breathing promotes the circulation of blood to the head. It follows therefore, that the senses of hearing, sight, and smell may

often be improved through respiratory gymnastics. Innumerable unfortunates are compelled to wear glasses in the endeavor to improve their vision, when the sole cause of their weakness is due to poor circulation in the head. Hundreds of cases have been brought to my notice in which the power of sight was improved as the result of deep breathing.

DEAFNESS.

Breathing is of the greatest value as a cure for Deafness, especially when the trouble is due to Catarrh, as is usually the case. Breathing seems to have a tendency to stimulate the Eustachian tubes, which lead from the air passages to the ear.

Thus I might continue to mention hundreds of disorders which may owe their presence almost entirely to shallow breathing, and which disappear when the breathing function is restored to a normal condition. When and when not a disorder is due to shallow breathing, is almost impossible to determine, but unless one is absolutely positive that the breathing function is perfect, it is reasonably safe to assume that shallow

breathing is at least, in part, the cause of such abnormal conditions.

ENDURANCE.

Endurance is mainly a matter of proper breathing; fatigue is nothing more than a symptom of excessive accumulation of poisons in the muscular tissue. Even under the most favorable conditions the blood cannot possibly carry off waste matter as fast as the muscle tissues produce it. The better the circulation of the blood, and the more freely the lungs cast off the excess of poison in the blood, the longer can a muscle continue to act without becoming clogged with refuse.

BRAIN FATIGUE.

Brain fatigue is subject to the same law as muscular fatigue. The brain, being enormous consumer of blood, (it is estimated that one-half the blood of the body is required to feed the brain alone), casts off a corresponding amount of waste matter. Unless this waste matter is carried off as fast as it is produced, brain fatigue necessarily results. There is no better stimulant for the brain than deep breathing. Experiments

have shown that if full deep breathing be indulged in just preceding a certain severe mental task, the brain is far more acute; for instance, if it requires ordinarily half a minute to add a certain column of figures, the same mental task can be accomplished in about twenty seconds if the blood is thoroughly aerated before beginning the task. Thought requires abundant blood. This accounts for the fact that mental giants are, as a rule, full-blooded, robust men. An anaemic may occasionally be found who has great mental endurance and acuteness of the senses, but such cases are exceptions. They would have still greater mental power were they to supply their brilliant brain with sufficient nourishment to prevent its becoming befogged in its own ashes.

I might continue indefinitely to give instances of the great value of full deep breathing. It is indeed the main source of life, vigor, and endurance. To neglect this priceless source of energy is a crime against our body and manhood.

CHAPTER XVII.

DEVELOPMENT OF THE CHEST AND BREATHING CAPACITY.

The development of the respiratory function is unquestionably the least understood branch of physical culture, that is, if the results obtained by our instructors may be used as a criterion of their knowledge of the subject. Of diaphragmatic breathing our instructors know practically nothing, even our physicians having but little knowledge regarding this important function, and few indeed can breathe diaphragmatically at will. It is only the most advanced teachers of singing that understand what is meant by diaphragmatic breathing, and are capable of imparting the knowledge to their pupils. Success in singing depends directly upon proper control of the diaphragm, hence the fact that the subject is given so much attention by vocalists.

When deep breathing is spoken of by our physical culturists and physicians, it refers,

as a rule, to chest breathing. When a physician advises his patient to practice deep breathing, he tells him to fill his lungs to the utmost in any manner that may be easiest, and then slowly exhale. This usually means enforced chest breathing. Often this form of breathing is combined with various movements of the arms, and is termed "breathing gymnastics."

DEVELOPMENT OF THE CHEST.

In discussing the development of the respiratory function, I shall first dwell upon the development of the size of the chest, and chest breathing capacity. It is generally conceded that breathing gymnastics are highly effective for the development of the chest and its mobility.

Some few instructors hold the theory that conscious breathing gymnastics are unnecessary in the development of the respiratory function. They claim that helpful exercise is all that is necessary to promote the full development of the chest and respiratory organs. The theory is, that the great demand for Oxygen by the blood during exercise necessarily increases the action of the lungs,

and that this activity produces the desired results.

The theory that physical exercise develops a normal respiratory power is false and most dangerous, as is proved by the fact that those who rely upon this means for the development of the lungs, just as readily succumb to Consumption as he who takes no exercise whatever. It is a well-known fact that nearly all of the world's greatest athletes have died of Consumption or Pneumonia. Several of the most prominent teachers of physical culture of the past, died of some disease of the lungs. I recall to your memory the death of Jack Kennedy, the champion strong man; Pennell, also a weight lifter of renown. While weight lifting does not require good "wind," the fact remains that Kennedy and Pennell had enormous chests and so-called "chest expansion." Dempsey and Peter Jackson, the celebrated pugilists, also died of Consumption, as did also the "Jap," the celebrated wrestler. These men unquestionably had what is known as "wind," for they could expand an enormous amount of muscular force without becoming distressed through inability to breathe freely.

I have a list of over two hundred athletes less prominent than these physical marvels, who died of Consumption or Pneumonia. Among them I can number not less than a score of former fellow athletes and companions. During the week I am writing these lines, two prominent college athletes died of Pneumonia, one a noted swimmer, the other the captain of a baseball team. Professor Dowd, the well-known physical culturist, weight lifter, and author, also died of Consumption. Many of the prominent physical culturists of to-day constantly contract Colds, and otherwise give indication that their lungs are very susceptible to disease.

As a rule the sudden death of an athlete is attributed either to dissipation or submission to undue risks. I have found this idea erroneous, and to be the case only in exceptional instances. The underlying cause of the death of athletes from lung troubles, is due to the fact that the external body is developed at the expense of the internal. In a perfect body, the functional power of every organ should be equal to the greatest demand that may be made upon it, either in time of rest, violent action, or disease. The power of the

lungs should be sufficiently great to be prepared to nourish the muscular system, nervous system, and other tissues with Oxygen as it is demanded, and to carry off whatever poison may be developed within the entire body. In a healthy adult, the breathing capacity should be about two cubic inches for every pound of bodily weight.

Observe the manner of the development of an athlete: he enters a gymnasium, let us assume with a breathing capacity equal to that of the average youth, approximately 230 cubic inches: he weighs, let us assume, about 130 pounds. Thus we note that on a basis of two cubic inches for every pound, he begins with deficient breathing capacity. In this condition he enters into general gymnasium work, consisting of dumb-bell exercises, running, jumping, wrestling, etc. Being young, and having good blood circulation and an active and strong heart, in due time his work will be rewarded by a general improvement in his dimensions and weight. If his progress is small, he will gain at least ten pounds during the first year. Often it is nearer twenty. Now let us investigate the improvement in his breathing.

If the gymnasium is up to date and equipped with all modern anthropometrical instruments, the athlete probably has had his breathing capacity tested when he entered. At the end of the year the "professor" again measures his breathing capacity, and, informs him that he has gained 15 cubic inches. (Records kept of many thousands of gymnasias members in various parts of the United States show that 15 cubic inches is the average gain the first year, and 5 cubic inches the second year.) The question is, has the athlete actually improved the power of his respiratory apparatus? Certainly Not! His breathing function has become weaker instead of stronger. He has added about 10 pounds or more muscle, bone, and tissue, and has added only 15 cubic inches to his respiratory power, whereas he should have increased his breathing power at least 20 cubic inches or more, in order to preserve a true balance between the sources of supply and demand of the body. "But," answers the instructor, "if as you say, this athlete's lungs have become comparatively weaker during the year, how do you account for the

fact that to-day he has 'good wind' and can run for miles and wrestle for hours without becoming 'winded,' whereas, when he started, he could not run twice around the track without puffing like an engine."

The assumption that "good wind" is an indication of good breathing power, is the most dangerous fallacy met with in physiculture. Many an athlete is now in his grave because he was led to believe that his breathing power was phenomenal, simply because he had good "wind." Simple tests readily prove that good "wind" is not an indication of great breathing capacity. Measure the breathing capacity of an athlete immediately before and after a severe course of training, and it will be found that it has not improved at all. The training has improved the blood circulation, the endurance of the breathing muscles, and it has tempered his grit, so that he has developed greater courage to endure the pain of fatigue, but it has not developed permanent endurance of the breathing muscles. The endurance of the breathing muscles is no more permanent than the endurance of any other muscle of the body. Let the greatest runner in the world

stop training for a few months and his "wind" will be a condition of the past.

EXERCISE MAY DECREASE BREATHING CAPACITY.

Certain forms of exercise have a tendency to decrease the breathing capacity. As shown in a previous chapter, the degree of expansion of the chest is governed by the elasticity of the chest walls, and the degree of power of the breathing muscles. If, for any reason, the expansion of the chest is impeded, as would be the case if a strap were tightly drawn around it, necessarily the chest cannot expand as fully as without the strap. The development of great masses of muscles around the chest and back, has the same effect on the expansion of the chest as would drawing a strong strap around it. Every inch of muscle crowded around the ribs tends to impede chest action.

In my practice such conditions have been brought to my notice many times. As an instance, I cite the case of a young man that called on me some years ago, with the request that I undertake to develop him into a heavy weight lifter. I informed him that

while I had had much experience in such work, at that time I was not prepared to accept him as a pupil, as I had practically discontinued that branch of instruction. I recommended him to several well-known instructors in New York City who made a specialty of developing "strong men." During our conversation, I suggested that he test his breathing capacity. Upon doing so, I found that his capacity was 270 cubic inches. As he was a man of heavy physique and about medium stature, I warned him that his breathing capacity was not exceptionally high. About six months later the young man again called on me. He informed me that he had greatly improved his lifting records, and that his chest had increased several inches in girth. This he believed was due principally to the breathing gymnastics he had practiced. I suggested that he test his breathing capacity, and upon doing so, it proved that he had lost about 50 cubic inches during the course of his training.

Exercise may be relied upon to develop the respiratory power only during the early periods of life, that is, when the chest walls

are quite flexible. In later life, the ribs become so hard and immobile that only the most extreme respiratory effort will produce sufficient motion of the chest walls to increase the flexibility thereof.

Perhaps the great muscular effort required to expand the chest to its limit may be better realized when it is stated that the resistance offered by the chest walls, when attaining an expansion of from three to four inches, is not less than fifteen hundred pounds. It is evident, therefore, that it requires extraordinary muscular effort to exercise the chest sufficiently to increase its flexibility.

MY PERSONAL EXPERIENCE.

My experience has proved that few have the will power and persistence to make such repeated extreme efforts to expand and contract the chest, that the breathing capacity will be materially improved. I found this to be true in my own case when I first decided to improve my breathing capacity. In 1889, when I first became an active athlete, I discovered, to my chagrin, that I had a breathing capacity of but 220 cubic inches. Inasmuch as I was aware that the deaths of athletes

were due, usually, to diseases of the lungs, I decided to make every effort to improve my breathing capacity. Accordingly, I practiced various methods of breathing gymnastics then in vogue. After six months of persistent work, tests made with a spirometer showed that I had gained but a few cubic inches in breathing capacity. It then occurred to me that I might be prompted to make greater effort, were I to practice daily with a spirometer, making repeated attempts to improve my record. The result was that, in less than a year, I had gained 80 cubic inches, and finally reached the remarkable record of 436 cubic inches, which, with few exceptions, is the highest breathing capacity ever recorded.

THE VALUE OF THE SPIROMETER.

Many thousands of pupils who have used spirometers under my guidance have experienced the same satisfactory results with the instrument as I. I recall one instance in particular, which proves the value of the spirometer in respiratory development. A man

of national reputation as a lecturer, teacher of elocution, and deep breathing, requested that I supply him with the type of spirometer employed in my work. He desired the instrument merely for the purpose of testing the breathing capacity of his pupils in elocution. I suggested that he personally use the instrument, and endeavor to improve his breathing capacity, which at that time was 260 cubic inches. As he had practiced breathing most persistently for 25 years, he had but little credence in the suggestion that the instrument could produce any improvement in his case. Three months after our interview, I received word that he had gained 60 cubic inches in breathing capacity, which, I believe, proved conclusively that, in all the years of his respiratory gymnastics, he really could not have exercised vigorously enough to produce sufficient chest action.

In view of the remarkable results attained with the use of a spirometer as a means for the development of the respiratory function, I unhesitatingly recommend such an instrument for that purpose. A special type of spirometer of my own design has been employed most effectively by over 30,000 of my

pupils, whose progress I have most carefully observed. Similarly, thousands of children in the public schools have used my instrument for the development of the chest and lungs, with correspondingly satisfactory results. Even in the case of the very feeble, and those in the advanced stages of Tuberculosis, its use is always accompanied by improvement. Although excessive use of the instrument has never been followed by evil effects, the best results are attained when about twelve full breathing tests are made twice daily. Breathing is a muscular act, and as any muscle becomes fatigued and sore if exercised too severely, it follows that excessive use of a spirometer may cause general soreness of the chest, which tends to retard progress.

Some physicians may consider the use of a spirometer dangerous to those with very weak lungs, and in fact I, too, had that impression at one time, but after having observed the use of the instrument by hundreds of consumptives, I am convinced that no injury can result therefrom. On the contrary, it has proved highly beneficial.

HUTCHINSON'S TESTS.

No logical reason could be given for the assumption that the use of a spirometer could be dangerous to any one. Hutchinson proved that the lungs may be inflated to contain one thousand cubic inches of air, without causing undue stretching or any injury to the lung cells or membranes. In his tests, the lungs were removed from the chest cavity (post-mortem), and inflated with a pump. The pressure and vacuum produced within the lungs during the most pronounced exhalation and inhalation is extremely small. An ordinary paroxysm of cough produces a decidedly greater pressure within the lung cells. Hutchinson highly recommended the use of a spirometer for the development of the breathing function. In view of the fact that a man of his knowledge of the respiratory function advocated such a measure, we may unhesitatingly employ a spirometer for this purpose.

VALUELESS DEVICES.

Care should be used in the selection of a spirometer to be used for the development of the lungs. The first requirement is that it

be accurate: secondly, the resistance must not be too great. Devices found at summer resorts, termed "spirometers," are usually inaccurate, and some so constructed that they measure respiratory force, rather than the volume of air breathed. The only form of spirometer that is reliable and accurate is the old wet type, such as is used for anthropometrical purposes in colleges and gymnasia, and which may be purchased from any manufacturer of anthropometrical instruments at a moderate cost.



CHAPTER XVIII.

HABITUAL DEEP BREATHING.

The prime object of respiratory gymnastics should be to inculcate the habit of deep breathing. As mentioned previously, the real recuperating process occurs during sleep. During sleep we absorb about four times as much Oxygen every hour, as is absorbed during the same period when awake. Similarly twice as much Carbon Dioxide is cast off hourly during sleep as at other times. During the sleeping hours, therefore, Oxygen is stored by the system, and excess poison, which the body could not eliminate during the day, is cast off. The real deep breathing performed, therefore, is during the sleeping hours. It is then that the greatest demand is made upon the respiratory system. Many physical culturists and physicians advise conscious breathing gymnastics, for the purpose of revitalizing the blood. They tell one to stand before an open window every morning, and take from 50 to 100 full breaths, for this purpose. Such advice is of little practical value. The fact

is that the little extra amount of Oxygen absorbed during such breathing gymnastics is exceedingly small as compared to the enormous quantity required daily to sustain life. There is no way by which blood can be made to absorb a large volume of Oxygen in a short time. The Oxygen absorbing capacity of the lungs is very limited, even under the most favorable conditions. Therefore, in order that the blood may be thoroughly aerated, and be stored with Oxygen to its fullest capacity, we must practice **habitual** deep breathing.

THE CONSCIOUS AND SUB-CONSCIOUS MIND.

The muscles concerned in the function of respiration, are governed both by the conscious and sub-conscious mind—that is, they are both voluntary and involuntary muscles. In explanation of what is meant by the conscious and sub-conscious manifestations of the mind, it must be stated that the seat of the conscious mind is in the brain, whereas the seat of the sub-conscious mind is in every nerve cell of the body. The conscious mind governs the voluntary action of the muscles,

and the sub-conscious governs the involuntary action. Thus, the heart is governed by the sub-conscious mind, and, in opposition, when writing, the muscles of the hands and arms are governed by the conscious mind. Through habit much work of the conscious mind is turned over to the sub-conscious. When a babe is learning to walk, the balance of the body and the movement of the legs require extreme conscious effort. Later, as the act of walking has been mastered, the conscious mind is relieved of the task of governing these movements, by the sub-conscious mind.

CONTROL OF THE DIAPHRAGM.

Thus it is that the sub-conscious mind is trained by the conscious mind. To inculcate the habit of deep breathing, therefore, it is necessary that we practice diaphragmatic breathing consciously until it becomes habitual. The more intensely we concentrate our conscious mind upon diaphragmatic breathing, the more rapidly will the sub-conscious mind begin to govern the act.

It is comparatively a simple task to acquire complete control over the action of the dia-

phragm, and develop its range to a high degree. Since in diaphragmatic breathing expansion and contraction of the trunk take place in the soft and resilient areas, and no bones need be bent and great resistance overcome, as is the case in chest breathing, rapid progress may be made at any age. The only pitfall that awaits the beginner, is that he may bring the abdominal muscles into action, when attempting to gain control over the diaphragm, and thus become confused.

The first step to be taken when learning to control the diaphragm is to gain a thorough knowledge of the action of the abdominal walls during breathing. To accomplish this, lie on the back in a relaxed state. It will be observed, by placing the hands on various sections of the chest and abdomen, that the greatest expansion and contraction of the trunk is in the abdominal region, at a point about midway between the lower end of the breastbone and the navel. It will be observed further, that there is no expansion and contraction of the chest. The student should practice this form of gentle diaphragmatic breathing for two weeks, about twice daily, so that he may become thoroughly acquainted

with the mechanical action that takes place. Then, for another two weeks, he should gradually increase the force of the action of the diaphragm, until he finally can take a full, sweeping diaphragmatic breath, without any perceptible movement of the chest.

DIAPHRAGM ONLY EMPLOYED.

After having mastered diaphragmatic breathing in a reclined position, it should be practiced while standing. Since the diaphragm is restricted in its action by the weight of the abdominal organs when the body is erect, breathing is not as free when lying on the back. Care should be taken that the diaphragm only be employed in breathing, that is, that the chest be not permitted to expand. By placing the hands on the chest as indicated in Fig. 15 it may readily be observed whether or not the chest is kept in a quiescent state when practicing diaphragmatic breathing. After diaphragmatic breathing has been practiced consciously in this manner for some weeks, gradually the action should become more forcible so that the range of the diaphragm may be increased. After thorough control has been developed, diaphragmatic



Figure 15.

breathing may be practiced consciously while walking or sitting. If this be persisted in a few months, gradually the act will become entirely an unconscious one, so much so, that if for any reason the action of the diaphragm be restricted, as would be the case if clothing be worn too tightly around the abdomen, one would be conscious of the fact, and would feel most uncomfortable.

AREA OF THE DIAPHRAGM.

As stated previously, the diaphragmatic breathing capacity depends, in a great measure, upon the actual area of the diaphragm. It is therefore highly essential that the chest girth be developed to a normal degree. This may be accomplished through special chest breathing exercises, which I shall describe later, and also through the use of either a spirometer, or Pneumauxetor. Forceful chest breathing also tends to increase the range of the diaphragm. Some instructors recommend breathing gymnastics that may be termed "combination chest and diaphragmatic breathing gymnastics." I would strongly advise against such practices, as there is great danger of a pupil becoming confused

in attempting to control the various sets of breathing muscles, and thus defeat the object of the exercise. Natural breathing is never a combination of the two methods of respiration, therefore, it is better not to attempt to combine the two, but to practice them separately.

“EXCURSION” OF THE DIAPHRAGM.

It may be mentioned here that, in the average person, the vertical motion of the diaphragm is about two inches; in those who have developed the action through practice, the range, or “excursion” may be as much as four inches. With the aid of the X-rays, the motion of the diaphragm may be observed quite readily. In my own case the excursion, when thus observed, proved to be about four inches. The best and most accurate manner of determining the degree of action of the diaphragm, is to measure the volume of air breathed with a spirometer. From statistics I have kept of many thousands of such tests, it was determined that the diaphragmatic breathing capacity is from two-thirds to three-quarters that of the full chest breathing capacity.

CHAPTER XIX.

GENERAL HYGIENE.

Health is not a matter of following any one special law of hygiene. Deep full breathing alone cannot insure perfect health nor restore a jaded and weakened body to normal condition. It is true that deep breathing should form the foundation of every treatment intended to build up the vital functions, and, in most cases, simply breathing gymnastics and the inculcation of the habit of diaphragmatic breathing alone prove sufficient, yet the fact remains that if other laws of hygiene were followed in conjunction with this **fundamental treatment**, progress would be far more rapid and satisfactory.

To begin with, the muscular system, both internal and external, requires a certain amount of exercise daily. Rapid and forceful contraction and relaxation of the great masses of external muscles of the body, and of the muscles of the arms and legs, promote the circulation of the blood. Of what value would be rich, pure blood unless it

were forced into the furthest recesses of the body? Exercise is an absolute necessity.

DIET.

Diet plays an important role in physiculture, and if abused, must affect the entire system adversely. The greatest evil met with is the tendency to eat too much food. Three full meals a day is too much for anyone but a day laborer. A man who leads a comparatively sedentary life, and does not expend enormous muscular energy, can derive all the nutriment necessary for the maintenance of the highest degree of health, from two light meals a day. When these two meals should be taken, depends upon various circumstances, and should be determined through careful experiment. As a rule it is best to omit breakfast. I consider it highly detrimental to gorge food into a stomach when the nervous system is but half awake, as is the case just after arising.

It is also advisable to eat but little food immediately before any mental exertion. As stated previously, the brain demands much blood; therefore, if the brain is very

active, but little blood is available for the digestion of food. Business men should eat a light luncheon, the heaviest meal of the day being eaten after the mental labors are over. The best course to follow, but which unfortunately is impossible for the average business man, is to recline for an hour or more after having partaken of food. During such a rest the mind should not be occupied with serious subjects, nor should one sleep. The repose should be a combination of physical and mental relaxation.

Persons with the slightest tendency to indigestion or other abdominal disturbances should never eat to fullness or satiety. This advice should especially be observed by those who are too fat. It is better to eat a little food and absorb it thoroughly, than to eat great masses and have it remain in the stomach for hours to ferment and clog the digestive system. In extreme cases of Chronic Indigestion, I have found it efficacious to eat as frequently as five times a day, restricting the quantity each time to only a few mouthfuls of food. My theory is that even the weakest stomach can digest the most indigestible foods, and even pois-

ons, if the quantity administered be sufficiently limited. If the stomach can digest but a few ounces of food at a time, the only logical course to pursue is to feed it accordingly.

MASTICATION.

Another important matter to be considered in eating is the act of chewing. While I believe that this important process can be driven to fanatical extremes, the fact remains that it is necessary to chew our food well in order to aid its digestion. It may truthfully be said that the digestion of food begins at the teeth and continues through the entire twenty-four feet of alimentary canal. It has been shown that grains and vegetable food require more chewing than meats. It is a well-known fact that animals that eat grains chew their food thoroughly, and others, such as cattle, rechew their food after it has once been swallowed.

The conclusion of the entire matter is that we should eat slowly, and deliberately, and not bolt our food. It is beyond my scope here to discuss the nutritive value of various foods or to suggest a diet. This is

a problem that should be solved by the individual himself, through careful experiment, and not through theory. That food is best for an individual which agrees best with him. Certain foods have an entirely different effect on different persons. Raw milk may prove of the highest benefit to one, and may severely constipate another. I have known persons in whom the drinking of pure water invariably would produce violent Indigestion. It is the opinion, however, of food experts, that a general mixed diet of meat, vegetables, fruits, and nuts, is best adapted to the average man. By food experts I mean real food experts, men retained by the governments of different nations for the purpose of testing the nutritive value of various foods; not pseudo scientists that have an interest in promoting the sale of some special article of food. These "food scientists" as a rule are men who have had no training in chemistry, and many are charlatans.

For years I have given the question of food much thought. From a humanitarian point of view, vegetarianism appeals strongly to me. But after a thorough trial in my

own case, and observation of its effect on hundreds of my pupils, I have become convinced that, for the average man, vegetarianism is impractical. It may be true that many persons improve both in general health and stamina after the adoption of the vegetarian diet, but this would not determine that such improvement is due really to the change in substance of the diet. Careful investigation would disclose that in most cases such improvement is due principally to other hygienic measures, which are practiced in conjunction with the new diet. There have been cases, however, where a vegetarian diet in itself has proved the means of restoring a deranged digestive system to normal strength.

CLOTHING.

The matter of clothing should be given due consideration in physi-culture. As is the case with every branch of hygiene, numerous theories have been put forth regarding proper clothing. One of the principal points to consider is that the clothing be so arranged that breathing is not interfered with. Women should not lace

themselves within an inch of suffocation. Men should not wear tight-fitting belts and waist bands. The diaphragm has enough resistance to overcome even under normal conditions, but when its action is restricted by tight-fitting clothing, deep breathing is impossible.

Avoid the two extremes, too much and too little clothing. The body should be kept comfortably warm in winter, but one should not fall into the habit of wearing an overcoat in mid-winter when it is quite warm, nor should one refuse to wear an overcoat in mid-summer, in case it should be unusually cold. We should clothe in such a manner that the body is never subjected to extreme changes in temperature.

No clothing should be worn that, in any manner, cramps any part of the body. Do not wear tight-fitting hats. Do not wear tight-fitting collars, that prevent free breathing. Do not cramp the chest; it cannot develop when restricted by clothing. Do not cramp the muscles of the legs. Men as well as women should not wear garters that strangle the circulation of the blood in the legs. Wear comfortable shoes. Un-

less one is compelled to walk through deep snow, it is a better plan to wear low shoes throughout the entire year. High shoes, as a rule, prevent free circulation of the blood in the feet, which necessarily leads to cold feet.

THE BATH.

Hydrotherapy is one of the most powerful remedial agents known, but at the same time it is one of the most dangerous when ignorantly applied. It is a better plan not to attempt to apply the water cure unless under the guidance of an experienced Hydrotherapist. The object of the bath in everyday life should be simply to keep the skin and the pores open. Thin and nervous persons should avoid cold baths, which are so persistently recommended by most hygienists. A cold bath may prove to be a wonderful stimulant for a healthy, robust man, but it is not so when indulged in by an anaemic. Thin persons should bathe for cleanliness only, the temperature of the water being comfortably warm. They should do everything possible to conserve energy. A cold bath causes loss of heat

that may require many hours of organic activity to replace. Fat persons, unless they be victims of some severe form of heart trouble, are much benefitted by the cold bath, as it awakens their circulation, stimulates the organs to activity, and compels the blood to nourish on the excess of stored fat.

FRICTION BATHS.

All forms of massage and friction baths are excellent, as they tend to promote the circulation of the skin. Alcohol may be used externally to assist in stimulating the skin, but the principle aim should be to bring the blood to the surface through friction. Usually a rough towel grasped at the ends and "sawed" across the body, is the most effective form of friction.

PURE AIR.

Inasmuch as the air exhaled from the lungs contains Carbon Dioxide and a certain quantity of organic matter, it is evident that if the same air be breathed again and again, the quantity of Carbon Dioxide and organic matter will constantly increase, until finally death will result from the general

poisoning of the blood. It follows, therefore, that it is highly necessary that the air breathed be as nearly pure as possible.

According to Parkes, a scientist who has made extensive investigation regarding the matter of ventilation, 2,000 cu. ft. of air space per head should be allowed in sleeping apartments, and in order that this volume of air may be kept at the standard degree of purity, 2,000 cu. ft. of fresh air must be supplied by means of ventilation every hour.

It is doubtful if many sleeping apartments are ventilated according to the standard set by Parkes. Most persons would consider an exchange of 2,000 cu. ft. or more an hour as being a dangerous draught. Perhaps 100 cu. ft. per hour would more nearly represent the average ventilation in our homes. Such meagre exchange of air necessarily leads to general physical depression, sleeplessness, nervousness, and, finally, to sickness.

VENTILATION.

In order to determine whether a room is properly ventilated, it is not necessary to have it equipped with delicate instruments

to record the exchange of air. Nature has given us the sense of smell, and if this sense be employed intelligently one need never be in doubt regarding the condition of the air in a room. If one walks from out of doors, where the air is pure, into a room, the nose will at once detect impurities in the atmosphere. In a well-ventilated room there will be no "odor of human beings," an odor that is difficult to describe, but known to every one.

The subject of ventilation leads to some interesting facts, which show how wonderfully Nature assists us in adapting ourselves to adverse conditions. It is a remarkable fact that the organism gradually adapts itself to poisonous air, and that a person becomes accustomed to breathing, without noticeable distress, air which, when first breathed, would be most intolerable. Claude Bernard illustrated this power of adaptation by experiments on various animals. A sparrow is placed in a glass jar of such size that it will live for three hours. If now, at the end of the second hour, (when it could have survived another hour), it be taken out and a fresh, healthy sparrow introduced, the lat-

ter sparrow will die instantly. That the human race gradually adapts itself to adverse conditions is well established. Miners, as is well known, can retain comparatively good health in an atmosphere that would soon kill one accustomed to fresh air. The fact that the death rate among the poorer class of Jews in the crowded districts of our great cities is less than that of other races under similar conditions, is believed to be due entirely to the fact that the Jew has, for centuries, been a city dweller, and his organism has become more or less adapted to adverse atmospheric conditions.

SLEEP.

It is one of the laws of Nature that every organ and every part of the body requires a period of rest. In the case of the heart the period of rest equals that of activity, the duration of each being about one half a second. The periods of activity and rest of the breathing muscles are also about equal. In the case of the large groups of voluntary muscles, such as are employed during exercise, also a long period of rest is required in order that the tissues may

fully recuperate. The brain, which necessarily must remain active continuously for long periods, requires a corresponding period of rest. The phenomenon we term sleep is a condition of rest of the brain. During this period the brain is but scantily supplied with blood, and the entire nervous system, therefore, is more or less insensible.

Besides being a period of rest for the brain, sleep is also the time set aside for the storing of energy. As shown in a previous chapter, Nature has seen the wise provision of permitting the blood to store Oxygen at night during sleep. If the total quantity of Oxygen absorbed in 24 hours be represented by 100, 67 parts are absorbed during sleep, and 33 parts by day, while similarly 52 parts of Carbon Dioxide are exhaled during the day, and 48 parts during the night.

Abundant restful sleep is therefore of the greatest importance in the maintenance of good health, and since, during sleep, the lungs are busily engaged in the storing of Oxygen, one of the most important laws of hygiene is, that we breathe pure air, and

not air that has been vitiated by having been breathed over and over again by ourselves or those sleeping in the same chamber.

No definite rule can be laid down as to the time required for sleep. Much depends upon the age and temperament of the subject. One safe rule to follow is to sleep until awakening occurs naturally, which usually means from eight to nine hours of continuous rest. Sleep should never be interrupted. Alarm clocks are among the worst enemies of health. Deficient sleep means that the process of the storing of energy has not been completed, consequently long before the day's labors have been accomplished, the reserve of Oxygen will have been consumed, with the result that physical and mental depression follow. Many who find that in the afternoon their powers begin to ebb, probably owe their depression to the lack of sufficient stored Oxygen. Some strange theories have been put forth regarding the subject of sleep. Experience indicates, however, that they have no real influence upon health. One theory is that

we should assume a certain position relative to the direction of the turning of the earth. Another is that our beds should be insulated on glass casters in order to prevent electricity from escaping from the body. Such strange theories are not in accordance with our knowledge of the laws of physics, therefore absolutely untenable. The lower animals, whose actions and habits, even to the minutest points, are governed by instinct, do not, by their position during sleep, strengthen the theories mentioned. If the direction of the flow of blood through the body could, in any way, be retarded or promoted by lying with the head in certain directions in reference to the compass, or if the magnetic currents of the earth could in any way influence the infinitesimal degree of electric or magnetic currents in the bodies of animals, the lower animals, through their wonderful instinct, would certainly give evidence of the fact.

The relative position of the vital organs indicates that the best position to assume during sleep is on the right side. For various reasons it is undesirable to lie flat on

the back or on the left side. Facing the light during sleep has a tendency to disturb, therefore it is wise to arrange the bed in such a manner that one's back is turned to the light while lying on the right side.



CHAPTER XX.

THE NOSE.

External air may enter the lungs through two openings, the first being the mouth, the second the nostrils. The relative position of the delicate valve in the throat, known as the epiglottis, governs the direction of the flow of air through the two passages. A careful consideration of the anatomical construction of the upper air passages makes it evident that the correct method of respiration is through the nose.

The nostrils, while rather small, open into double air chambers of approximately 20 square inches of wall surface. Projecting into the nasal cavity are small bones, which are lined with tissues richly supplied with blood vessels. The object of these protrusions is to warm and moisten the air that is inhaled.

The nasal chamber is also richly endowed with mucous membranes, which emit a secretion highly destructive to all forms of germ life. Therefore, instead of dry, dusty,

and germ-laden air entering the delicate lungs, as would be the case in mouth-breathing, air breathed through the nose is first filtered by passing through a growth of stiff hair in the nostrils, and, as it whirls through the nasal chamber, it is warmed, moistened, and freed of bacteria. It has been estimated that nearly a pint of moisture is absorbed daily by the air as it passes through the nasal chambers. Furthermore, it has been shown that zero air breathed through the nose, attains a temperature of 80 degrees by the time it reaches the bifurcation of the bronchial tubes; on the other hand, zero air breathed through the mouth, remains below the freezing point when it enters the lungs.

Too great stress cannot be laid upon the importance of nose breathing. Few practices are as dangerous to the health as mouth breathing, especially among children. This pernicious practice is certain to undermine the health of the most robust child, impeding its mental development, causing various deformities of the chest, such as chicken or pigeon breast, barrel chest, funnel chest, round shoulders, etc. In mouth

breathers, the eyes become dull and expressionless, the sense of hearing becomes poor, the lips and jaws deformed, the voice attains a nasal twang, and, upon awakening, the breath is foul. On account of deficient oxygenation of the blood, the general health becomes impaired, and consequently normal growth of bone and tissue is retarded.

MOUTh BREATHING PREVALENT.

In our schools may be found thousands of victims of mouth breathing. One has but to glance at a school-room full of children to single out the mouth breathers. Their pitiful vacant faces and open mouths, are unmistakable evidence of their plight. In their studies they lag behind the nose breathers, and by their teachers these unfortunates are, as a rule, stamped as "lacking."

Mouth breathing is not a habit. No child would breathe through the mouth if it were possible for him to breathe freely through the nose. Applying bandages over the mouth during sleep, with the view of correcting the "mouth breathing habit," is of little

value, as the practice is the result of some obstruction in the nasal passages. In children, in most cases, it is due to enlarged tonsils and adenoids (an abnormal growth in the throat). In adults the obstruction is usually due to enlargement of the turbinated bones in the nasal cavity. Repeated colds cause these bones to become enlarged to such a degree that they obstruct the passages. Often a severe blow on the nose may lead to such obstruction. But whatever the cause, immediate steps should be taken to have the obstacle removed. In children the adenoids should be removed and the tonsils cut, through a simple operation. If the turbinates are enlarged, an operation should also be performed upon them. Forceful breathing through the nose may relieve such conditions in time, but few are persistent enough to cause a complete recovery, hence, I always advocate an operation.

Parents cannot be too observant in watching for symptoms of mouth breathing in their children. Even when nursing, the first signs of obstruction of the nose may be detected, by an infant being obliged to discontinue nursing in order to take a breath

through the mouth. It is needless to state that plenty of fresh air and out-door exercise is a natural preventative of obstructions in the air passages. The children that are caged in poorly ventilated rooms, are those most subject to such troubles.



CHAPTER XXI.

RESPIRATORY GYMNASTICS.

The attachments of certain groups of external muscles of the trunk to the chest walls are such, that contraction of these muscles may be employed to assist in the development of the chest and respiratory capacity. It would be impractical here to attempt to describe the various ways in which certain movements of the arms or head tend to elevate the chest walls or contract them, as to understand them would require a thorough knowledge of the anatomy of the trunk, with its complex system of musculature.

In order that the breathing muscles may be brought into close relation to the brain, it is well to practice before a mirror, so that the movement of the chest may be observed. Occasionally practice to localize the expansion of the chest; for instance, place the tips of the fingers of the right hand about two inches above the left nipple, then take a deep breath and attempt to confine the

expansion of the chest to the point touched by the fingers. In a similar manner, efforts should be made to expand various sections of the chest. When walking take a certain number of steps to each respiration, making one more step in the inhalation than the exhalation. The number of steps taken depends upon various conditions; usually eight and seven is a desirable rhythm.

It is highly essential that all the muscles concerned in the expansion and contraction of the chest be under perfect control. If the respiratory muscles have been properly trained, they should respond to the will as readily as the muscles that control the motion of the fingers. Many years of training have given me such excellent control over my breathing muscles that it is possible for me to expand or contract either side of the chest independently, or I can cause a distinct expansion in any section of the chest. When the breathing muscles are under such perfect control, the sub-conscious mind will find them ready to respond when called upon.

I shall present herewith a series of breathing gymnastics especially arranged to pro-

mote the general development of the chest and the respiratory capacity. The series is divided into three lessons, the time to be devoted to each lesson depending upon the age, strength, and temperament of the student. Children under the age of ten should be led very gradually into the course. An entire year should be devoted to the first series of exercises, two years should be devoted to the second series, and finally the third series should be practiced. A child should not be permitted to practice the third series too early in life. Its chest walls are sufficiently flexible to permit a normal development without resorting to the extreme movements embodied in the third series. After the age of fifteen, this series may be practiced without danger of unduly stretching any ligaments. After the age of eighteen no harm could follow the practice of any of the exercises given. This statement should not be construed as meaning that one may practice the exercises without regard to their relative severity. Even the strongest man should begin with the first series, and not take up the second until he

has given ample time to the first. I would suggest the following plan. Practice the first series in the order named twice daily for three weeks, about ten movements of each exercise being sufficient for the strongest. Exercise six consecutive days, then rest the seventh. Five movements of each series is ample for consumptives, or those whose endurance is rather limited. Practice the second series of movements in a similar manner for four weeks. One day each week drop the second series and practice the first instead. Then practice the third series four weeks, adopting the second series one day in each week as before. After having completed the three series of exercises, drop the first entirely, but practice the second and third alternately. Always breathe through the nose when exercising. Have your room well ventilated. In winter wear enough clothing to prevent becoming chilled, as a chilled muscle cannot act to the highest degree. Do not exercise within ten minutes before eating, or two hours after.

BREATHING EXERCISE No. 1.**SERIES A.**

Starting Position: Standing position shown by solid line, with arms raised at the side at the level of the shoulders, palms down. Heels should be together, and toes turned outward as shown. This is the fundamental position of the feet in all exercises, unless otherwise mentioned. The head should be held in an upright position with chin well drawn in.

First Movement—Consists in taking a full chest inhalation. During the inhalation, there is a rotary movement of the arms, with a slow upward turning of the palms. The entire movement is slow, the palms reaching the everted position as the inhalation reaches its greatest height. The duration of the movement and inhalation should be about three seconds.

Second Movement—Exhale and drop arms to the sides. This exercise should be repeated from 10 to 20 times in succession, at intervals of about 10 seconds.

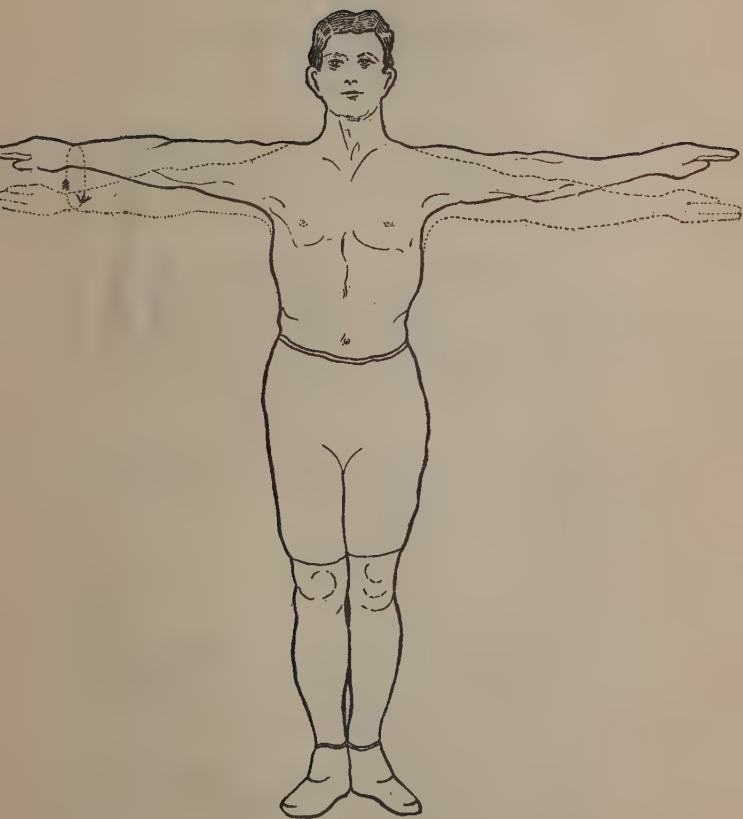


Chart 1 — A

BREATHING EXERCISE No. 2.

SERIES A.

Starting Position: Standing position shown by solid lines, with hands on the hips, and shoulders back.

First Movement: Take a deep inhalation of about 5 seconds duration, during which the chest is raised and the head thrown slightly backward as shown in dotted line. Do not allow the chin to protrude.

Second Movement: Exhale and return to normal starting position. Perform the complete movement from 10 to 20 times at intervals of 10 seconds.

SPECIAL CHARTS

SEPARATE CHARTS of the Exercises described in this book may be obtained from the Author. Price of complete set, consisting of 15 Charts of Breathing Exercises and 13 Charts of Muscle Building Exercises, is 50 cents, postpaid.

Each Exercise, and the explanation thereof, is printed on a separate sheet of card-board, thus offering a most convenient form for reference.

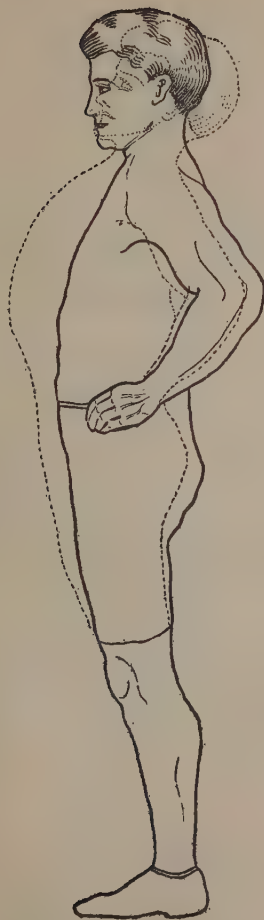


Chart 2—A

BREATHING EXERCISE No. 3. SERIES A.

Starting Position: Assume the same position as in exercise No. 1.

First Movement: This exercise is a combination of exercises Nos. 1 and 2, namely, rotation of arms and backward throwing of head during inhalation. Duration of movement and inhalation, five seconds.

Second Movement: Exhale and drop the arms at the sides as in Exercise No. 1. Perform complete movement about eight times at intervals of 10 seconds.

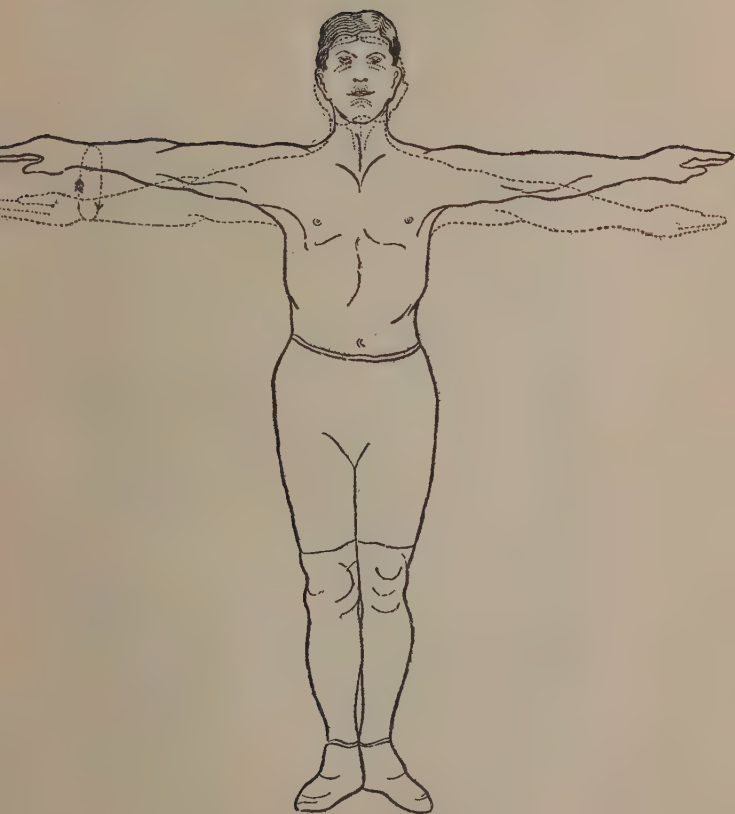


Chart 3—A

BREATHING EXERCISE No. 4.**SERIES A.**

Starting Position: Assume the position as shown in solid line.

First Movement: Take a deep inhalation, and while doing so, stretch the arms slowly above the head, until they reach the position shown by dotted lines. Be sure to stretch the arms to their greatest height. The duration of inhalation and movement should take about three seconds.

Second Movement: Exhale and return arms to starting position shown in solid line. This exercise should be repeated from 10 to 20 times at intervals of five seconds.

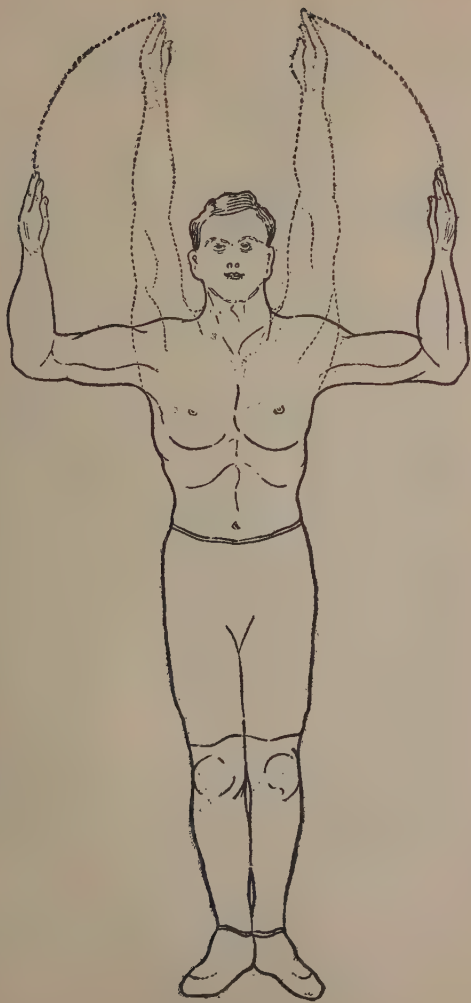


Chart 4—A

BREATHING EXERCISE No. 5.**SERIES A.**

Starting Position: Assume starting position as shown by solid line.

First Movement: Consists of a rotary movement of the shoulders, the arms hanging at the sides. Deep inhalation should accompany the first three-quarters of the movement, and exhalation the last quarter; or, in other words, inhalation takes place during the forward, upward and backward motion of the shoulders, and exhalation during the drop of the shoulders. The duration of inhalation should be about three seconds; the duration of exhalation, one second.

This movement should be repeated from 15 to 20 times, at intervals of five seconds.



Chart 5 — A

**BREATHING EXERCISE No. 1.
SERIES B.**

Starting Position: Assume starting position as indicated by solid line.

First Movement: Raise the arms forward and over the head as indicated by the upward pointing arrows. A deep inhalation is taken during this movement and is so timed, that the greatest height of inhalation is reached when the arms are extended to their greatest height above the head.

Second and Third Movements: The arms are dropped sideways to the level of the shoulders, with palms turned upward, as indicated by the arrows in dotted outline. At the level of the shoulders, the dropping of the arms is checked for an instant, and a rotary motion performed, so that the palms turn downward. This constitutes the third movement.

Fourth Movement: Consists in dropping the arms to the original position.

Exhalation takes place during the second, third and fourth movements. Duration of inhalation, five seconds; duration of exhalation the same. This exercise should be repeated from 10 to 15 times at intervals of 10 seconds.

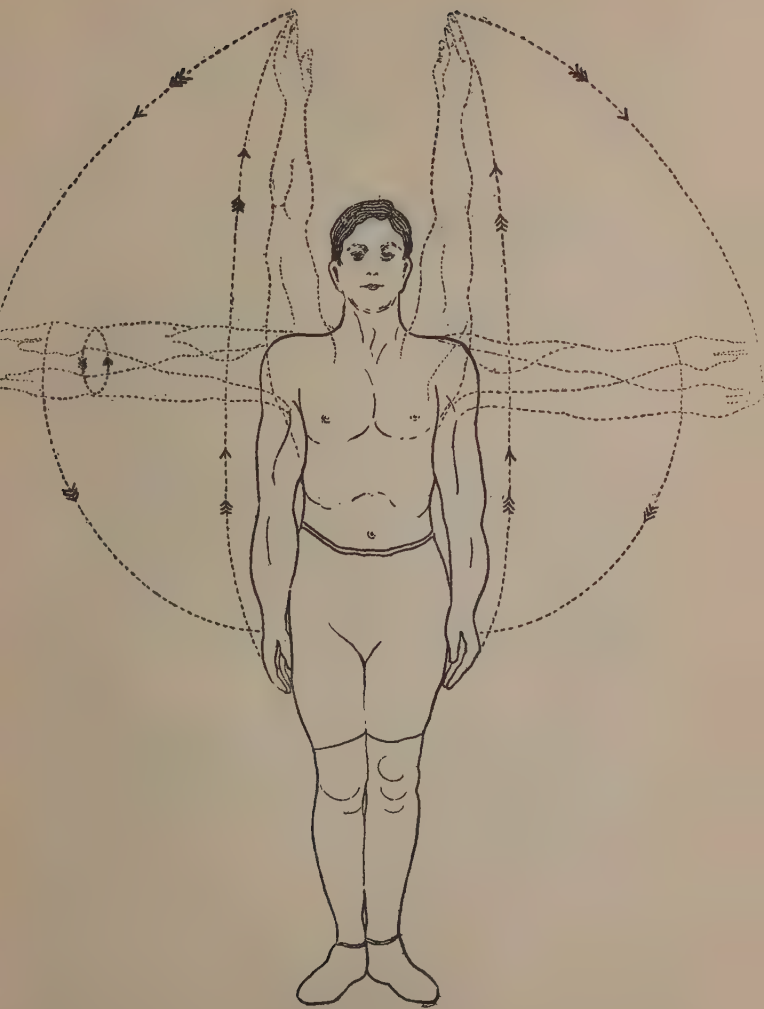


Chart 1 — B

BREATHING EXERCISE No. 2.
SERIES B.

Starting Position: Assume starting position as indicated by solid line, with palms turned down.

First Movement: Consists in executing an 18-inch circle with the arms, as shown in the diagram, ending with palms turned upward. A deep inhalation is taken during the movement, the extreme height of inhalation being reached at the end of the movement. Duration of inhalation, three seconds.

Second Movement: Exhale and drop the arms to the sides. This exercise should be repeated from 10 to 20 times at intervals of 5 seconds.

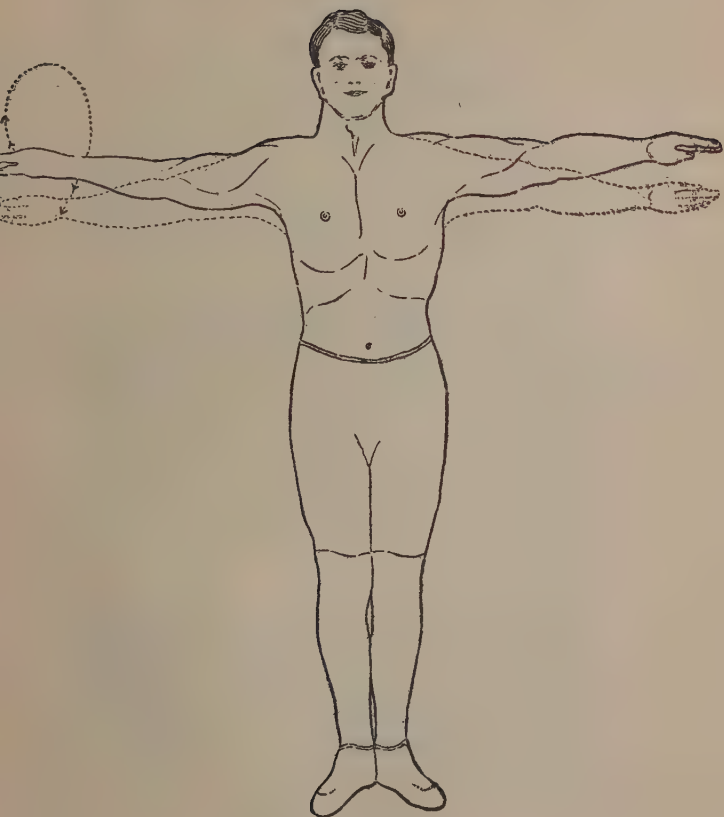


Chart 2—B

BREATHING EXERCISE No. 3. SERIES B.

Starting Position: Stand with the feet in the fundamental position, and arms as indicated by the solid line.

First Movement: Raise the arms above the head as indicated by the dotted lines. At the same time, the body is raised on the tip toes. During this movement, a deep chest inhalation is taken, the greatest point of inhalation being when the arms are vertical above the head. The duration of inhalation and movement should be about four seconds.

Second Movement: The body is lowered on the heels, and the arms dropped to the sides during exhalation. This exercise should be repeated from 10 to 15 times, at intervals of 10 seconds.

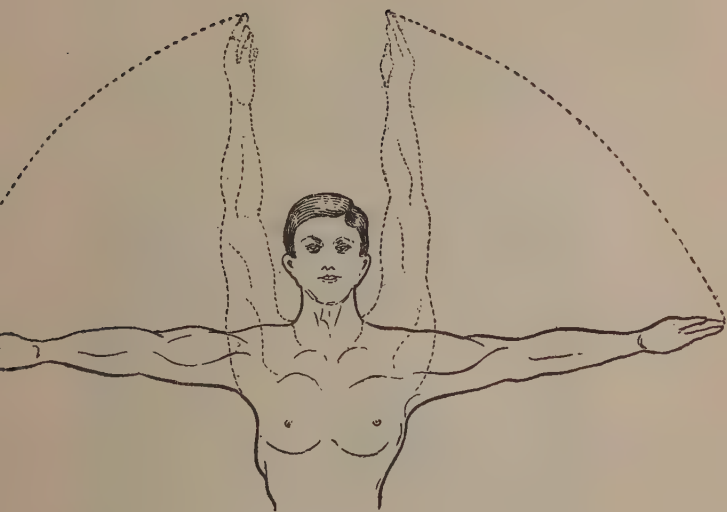


Chart 3—B

BREATHING EXERCISE No. 4. SERIES B.

Starting Position: Assume the normal standing position, but with elbows raised to the level of the shoulders, and bent, as shown in the solid lines. The illustration shows a view of the exercise from overhead.

First Movement: Fling the arms to the extended position indicated by dotted lines. The turning of the palms occurs near the end of the movement. A deep chest inhalation is taken during the movement. The inhalation must necessarily be rapid, but not exceeding two seconds.

Second Movement: Exhale slowly, and drop the arms to the sides. This exercise should be repeated from 10 to 20 times, at intervals of 5 seconds.



Chart 4—B

BREATHING EXERCISE No. 5. SERIES B.

Starting Position: Assume the position as indicated by solid lines, arms extended forward and palms turned downward, as shown.

First Movement: Raise the body to the erect position and fling the arms backward as indicated by the dotted lines. The turning of palms takes place near the end of the movement. A deep chest inhalation is taken during the exercise. The duration of the movement and inhalation should be about three seconds.

Second Movement: Exhale and drop arms to the sides. This exercise should be repeated from 8 to 12 times at intervals of 10 seconds.



Chart 5 — B

BREATHING EXERCISE No. I.
SERIES C.

Starting Position: Assume the position shown in solid line.

First Movement: Raise the body to an erect position, and extend the arms over the head as indicated by the dotted line. Deep inhalation should be taken during the movement. Duration of inhalation and movement should be five seconds.

Second Movement: Exhale and drop arms to the sides. This exercise should be repeated from 8 to 10 times, at intervals of about 15 seconds, alternating the position of the feet, that is, first perform the exercise with the left foot forward, and then with the right foot forward.

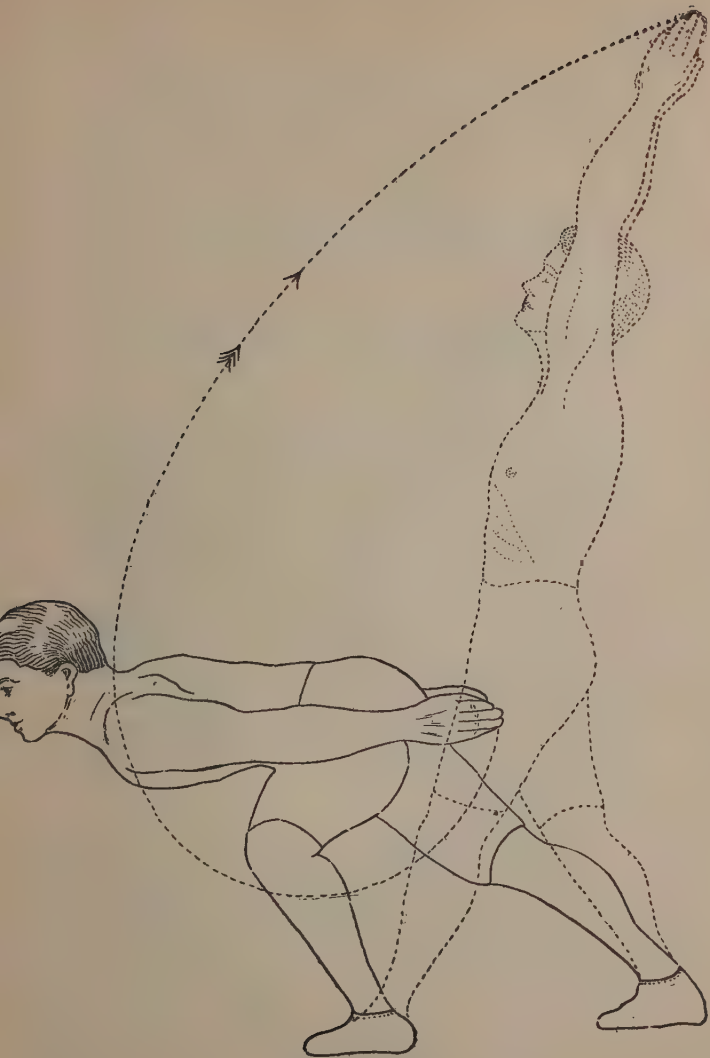


Chart 1 -- C

BREATHING EXERCISE No. 2.
SERIES C.

Starting Position. Assume starting position as indicated by solid lines.

First Movement: Throw the body backward as indicated by the dotted lines. During this movement the arms swing forward and upward. At a point indicated by the cross in the dotted circle, the arms are parted and lowered to the level of the shoulders, as indicated in the dotted figure. The movement should be so timed, that the body and the arms simultaneously reach the position indicated by the dotted figure. A deep chest inhalation is taken during the movement. Duration of inhalation and movement should be five seconds.

Second Movement: Return body to original position, drop arms to the sides, and exhale. This exercise should be repeated from 8 to 10 times at intervals of 10 seconds.

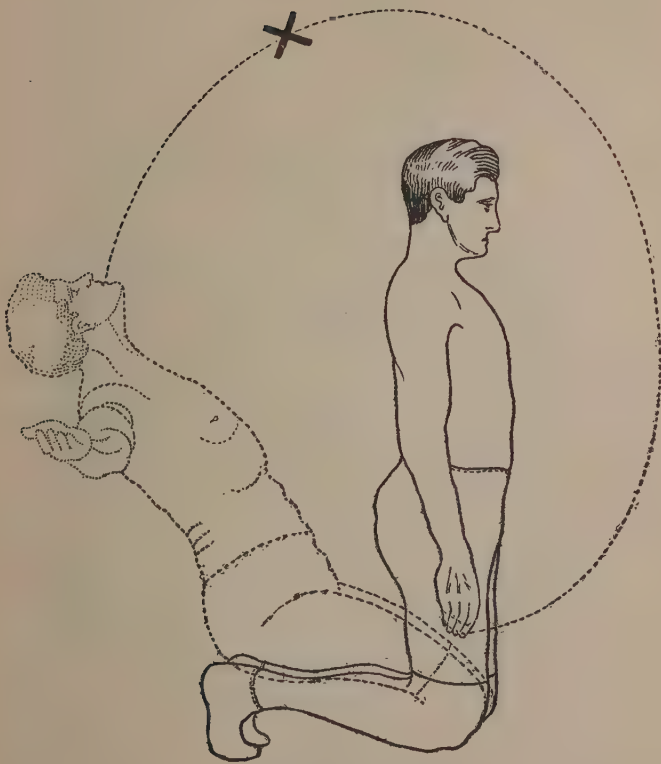


Chart 2—C

BREATHING EXERCISE No. 3. SERIES C.

Standing Position: Assume the position as indicated by the solid lines, clasping the hands firmly behind.

First Movement: Slowly take a deep chest inhalation, and throw the head and shoulders back, as indicated by the dotted lines. Duration of inhalation and movement should be four seconds.

Second Movement: Exhale and assume the original position. This exercise should be repeated from 10 to 15 times, at intervals of 10 seconds.

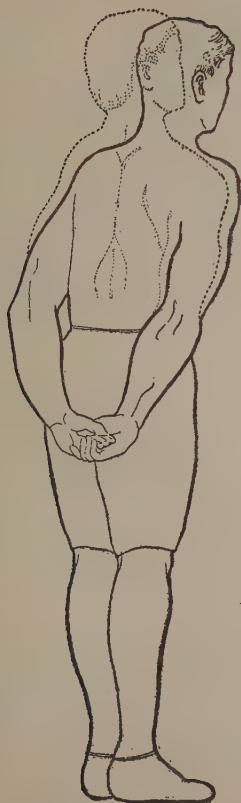


Chart 3—C

BREATHING EXERCISE No. 4. SERIES C.

Standing Position: Stand in the position indicated by the solid lines, keeping the back absolutely straight and the legs absolutely rigid. Press firmly with the fists against the back. If the proper position be taken, a strain will be noted in the back of the legs.

First Movement: Slowly fill the lungs, and raise the body to the erect position, with chest well raised and head thrown back. Time the inhalation so that the lungs are fully inflated when the body is erect. Duration of movement and inhalation should be four seconds.

Second Movement: Drop the arms to the sides and exhale. This exercise should be repeated from 10 to 15 times, at intervals of 10 seconds.

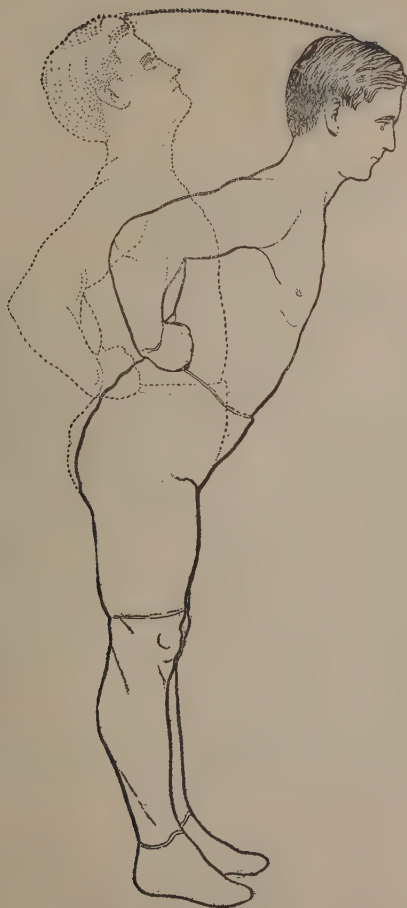


Chart 4—C

BREATHING EXERCISE No. 5.
SERIES C.

Stand on the right foot, raising the left off the floor, Reach as high as possible with the left hand. Drive a pin into the wall at a point representing the best effort. When reaching take a full chest inhalation. Continually try to better the reach. Change the position by standing on the left foot and reaching with the right hand. If a proper effort is made, a strain will be felt through the arms and upper body. If it is possible to reach higher with one hand than with the other, use two pins. Allow the pins to remain in the wall from day to day, in order to be able to note the improvement.

This exercise should be repeated from 6 to 8 times.



CHAPTER XXII.

EXERCISE.

Muscular tissue, in order that it may retain its functional power, must be forcibly contracted and relaxed at frequent intervals. Muscular tissues, as do all other tissues of the body, deteriorate if unused. A dormant muscle gradually shrinks in size and loses its contractile force and power to obey both conscious and sub-conscious mind. Since certain groups of muscles are vitally concerned in supporting various organs and assisting them in performing their functions, it follows that atrophy of the muscular tissues must necessarily undermine the health and general vitality of the body. Furthermore, activity of the muscular system is one of the chief factors in the promotion of blood circulation. Hence it follows that if our daily labors do not compel the proper exercising of the muscular system, it becomes our duty to devote a certain amount of time especially to that purpose.

Devising means of exercising the import-



“ BREAKING A CHAIN ”

Posed by the Author

ant groups of muscles of the body is by far the simplest branch of hygiene. It is simply a problem of devising movements that cause an alternate contraction and relaxation of the muscles. Compel the muscular tissues to act, and the natural result will be that they will improve in quantity and quality—that is, they will develop in size and in their contractile force.

Though some instructors claim to have devised systems that are vastly superior to all others, it is questionable if such claims are justified. It is true that some forms of exercise are more interesting and require less nervous concentration than others, but beyond this they have no special merit. No instructor should claim that his system is the only form of physiological exercise. All exercise is physiological. Swinging a dumb-bell aimlessly in the air is physiological exercise.

The series of exercises which I present herewith has been employed by me with much success in my school for a number of years. Some of the exercises presented I originated myself, others have long been employed by gymnastic instructors. The entire series is to be practiced, not merely

a few exercises which might happen to appeal most strongly to a student. As a rule, an exercise that appears to be most awkward is the very one that should be given special attention, as it very probably engages muscles that are especially weak, and under poor control of the mind. A safe rule to follow is to practice until fatigue is felt. If exercise is followed the next day by physical depression, it is an indication that the exercise has been too severe, and consequently the amount of work should be reduced.

BAR EXERCISES.

The first series of exercises consists of movements in which a broomstick, or similar bar, is employed. Unlike most bar exercises, however, in these movements the bar is more than simply an object to preserve the rhythmical movement of the arms. The bar, in the exercises here presented, serves as a means of enabling one set of muscles to antagonize another set. The principle may readily be understood by referring to Muscle Building Exercise No. 1.

MUSCLE BUILDING EXERCISE No. 1.

The bar is grasped firmly with both hands, as indicated by the solid lines. At the same time muscular force is exerted, tending to separate the hands, or, in other words, tending to stretch the bar in length, if it were possible. With the muscles of one side of the body thus antagonizing the muscles of the other, the bar is slowly raised above the head, as indicated by the dotted figure. The second movement consists of lowering the bar again, but always preserving the outward tension of the arms. The movement should be made quite slowly, and it is highly important that the pulling force exerted on the bar be very great. The object in bringing the bar over the head is to shift the antagonization to various sets of muscles.

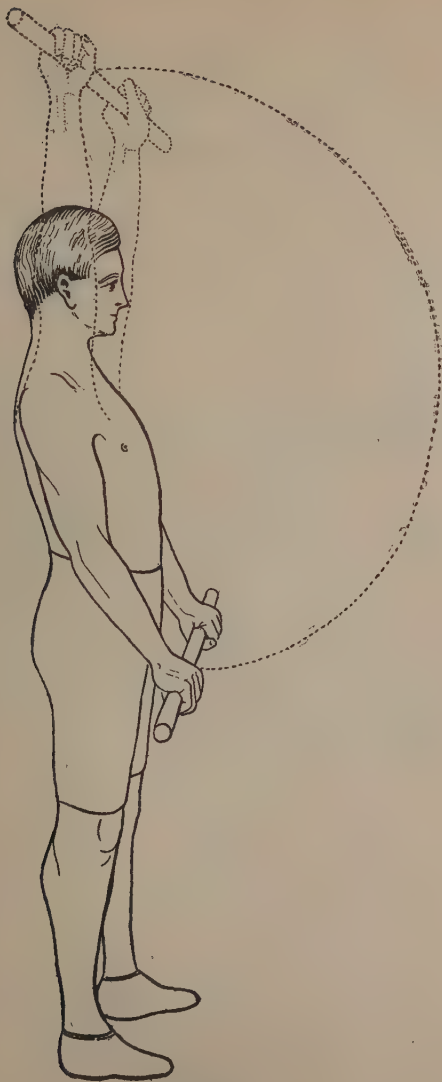
The second step in this exercise consists in making the same movement with the bar, but instead of pulling on the bar, pressure is exerted with the arms, tending to bring the hands together. Thus it will be noted that entirely different sets of mus-

cles are brought into play, though the movement of the bar remains the same.

With this movement as a basis, scores of different exercises, which are very effective, may be devised by any layman. For instance, the bar may be brought to the chest, and then slowly extended overhead, or forward—or it may be brought into numerous other positions. During these motions, the direction of pressure on the bar should be continually changed, as previously described.

When performing muscle building exercises, no especial attention should be given to the form of breathing. Follow the advice given in regard to not holding the breath (see Chapter XXVIII), simply breathe freely, either diaphragmatically or by the chest method.

It would be impractical here, to attempt to advise how often each exercise should be executed, as this would depend entirely upon the degree of strength and endurance of the pupil. Simply follow the advice given in a previous paragraph.



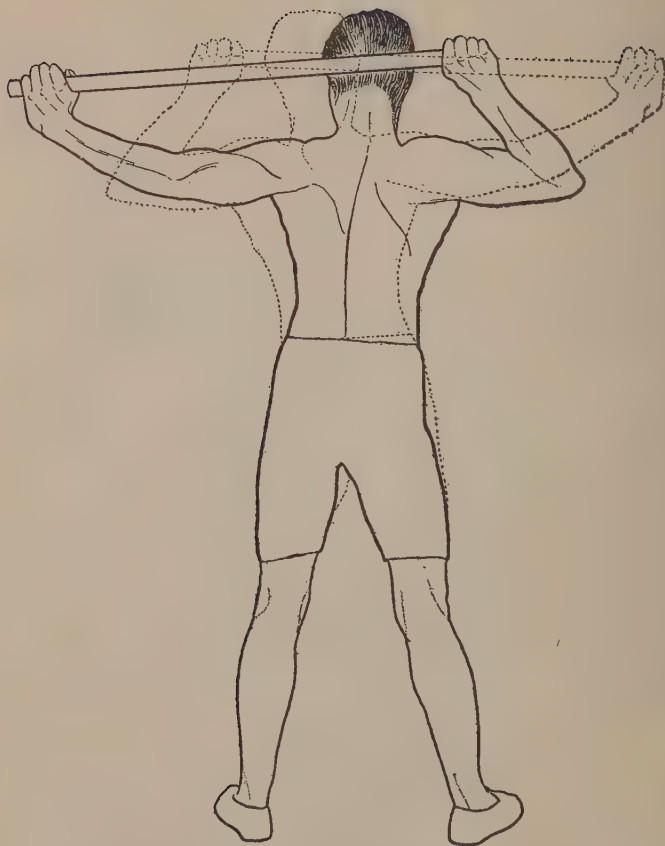
M. B. — 1

MUSCLE BUILDING EXERCISE No. 2.

In this exercise the same principle is employed as in Muscle Building Exercise No. 1. With a slow sweep, the bar is brought from the position indicated by the solid line down to the position indicated by the dotted line, and back again. During the movement, pressure is exerted upon the bar alternately, as previously described.

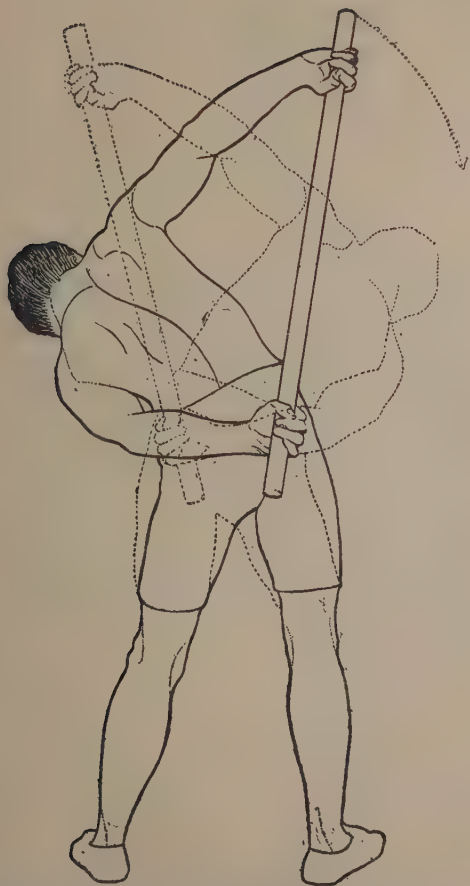


M. B.—2



MUSCLE BUILDING EXERCISE No. 3.

Execute the movements indicated above.

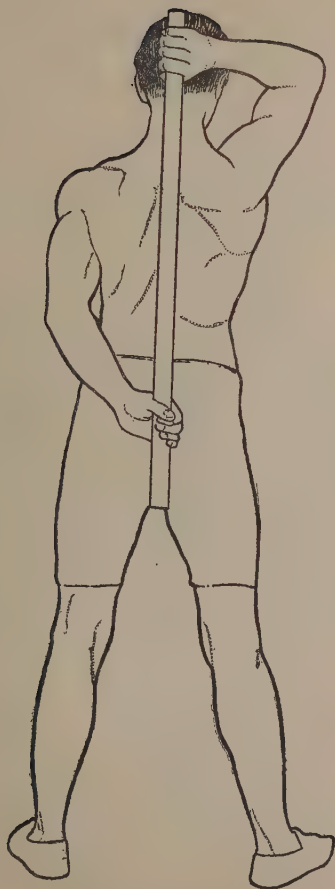


MUSCLE BUILDING EXERCISE No. 4.

Execute the movements indicated above.

MUSCLE BUILDING EXERCISE NO. 5.

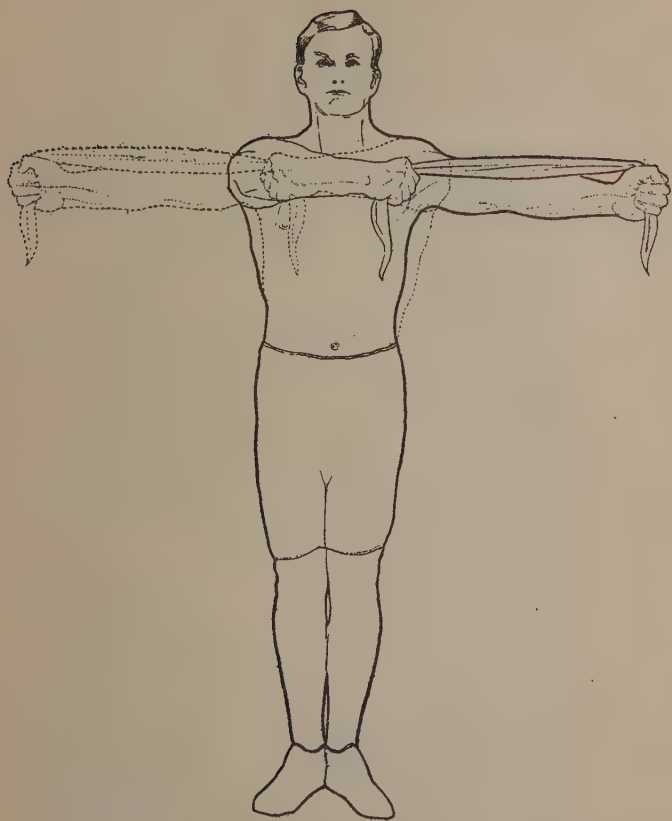
Muscle Building Exercise No. 5 is similar to the previous bar exercises described, with the exception that the bar remains stationary, instead of being moved through various arcs. In performing the exercise, vigorous alternate pulling and pushing force is exerted upon the bar, as in previous exercises. This exercise may be varied by holding the bar in many different positions, and alternately pulling and pushing on the same.



M. B. — 5

TOWEL EXERCISES.

An ordinary hand towel may be used with excellent effect as a means of antagonizing one set of muscles against another. The underlying principle of towel exercises is the same as that of the bar exercises, with the exception that the use of the towel does not permit of alternate pulling and pushing. The use of the towel has the advantage, however, of making possible movements that would be most awkward with the bar.



M. B.—6

MUSCLE BUILDING EXERCISES

Nos. 6, 7 and 8.

A simple and very effective exercise is represented by chart M. B. 6. A towel is grasped firmly in the hands, as indicated by the solid outline. Then the towel is slowly brought to the right side of the body, as indicated by the dotted lines. It will be observed that the left arm resists the effort of the right arm, thus causing a pronounced antagonization of the muscles of one side of the body to those of the other side. This exercise may be varied in many ways, as in the case with the previously described bar exercises. Charts M. B. 7, and M. B. 8, offer examples of such variation.

The bar and towel exercises described, offer unlimited possibilities. It may readily be observed that the greater the strength of the pupil, the greater will be the resistance. On the other hand, a weak, undeveloped person need have no fear of straining any set of muscles, as his own weakness acts as a safe-guard. If these exercises are persisted in, the muscles may be developed to their limit.



M. B.—7



M. B.—8

BODY EXERCISES.

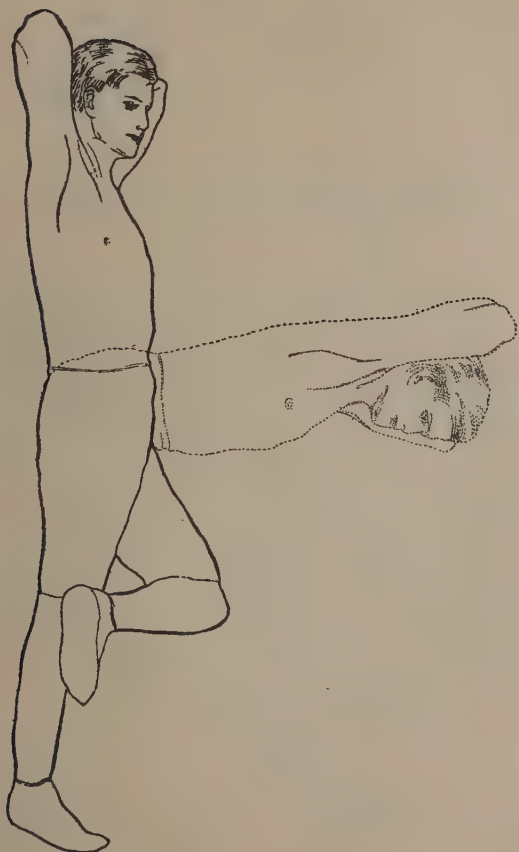
There are various movements of the body which demand a powerful contraction of certain sets of muscles. Such movements are highly effective, not only as a means for the general stimulation of the body, but also for the development of important groups of muscles of the trunk. In these movements, which I term "body exercises," the weight of the body offers the resistance to the muscles.

Exercises Nos. 9, 10, 11, 12, and 13 are some of the most effective of the "body exercises."

MUSCLE BUILDING EXERCISE

No. 9.

This exercise is a variation of what is commonly known as the "sitting-up exercise." As performed usually, the pupil braces his feet under some convenient place, folds his hands in back of his head, and then raises himself to a sitting position. This exercise vigorously taxes the abdominal muscles. The variation of the "sitting-up exercise" consists in simply bracing one foot and permitting the other leg to remain inactive, by crossing it over as indicated in the chart M. B. 9. The exercise should be alternated so that first one leg may be employed, and then the other. In performing the exercise, care should be taken that the upper body be held straight and rigid.

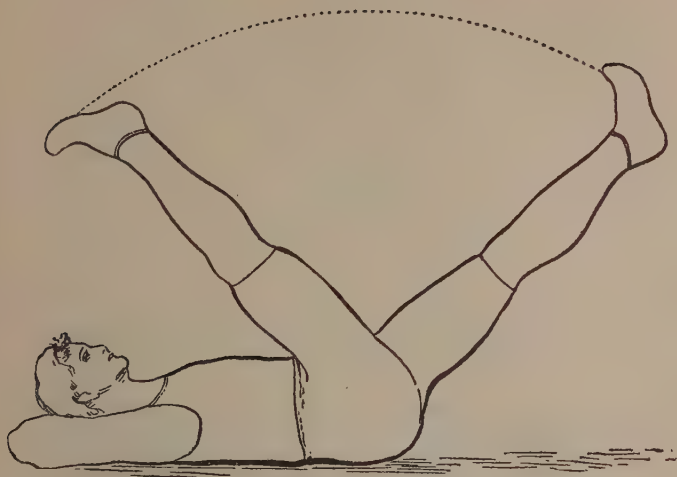


M. B.—9

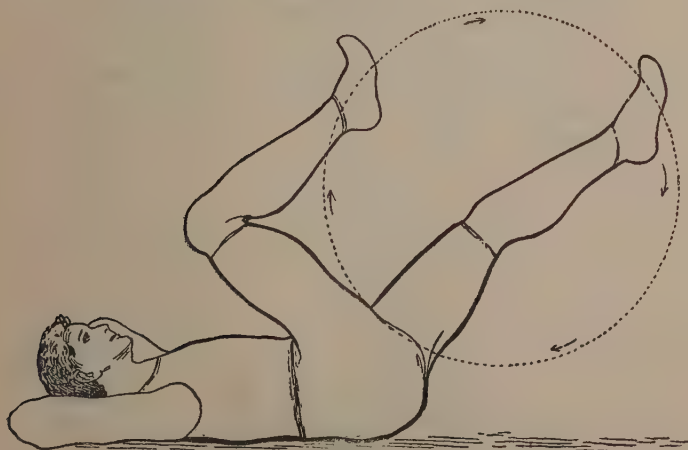
MUSCLE BUILDING EXERCISES

Nos. 10 and 11.

Muscle Building Exercises Nos. 10 and 11, represent two excellent leg exercises, which also strengthen the muscles of the abdomen and the pelvic region. They are especially valuable in that they promote the blood circulation in the lower limbs. In Muscle Building Exercise No. 10, a rapid, oscillating movement of the legs is performed. One leg is brought forward as the other is brought backward. The legs are kept straight, and at the end of the movement they are brought to a sudden check. In Muscle Building Exercise No. 11 a rapid running motion is performed, as described by the circle in the diagram.



M. B. — 10

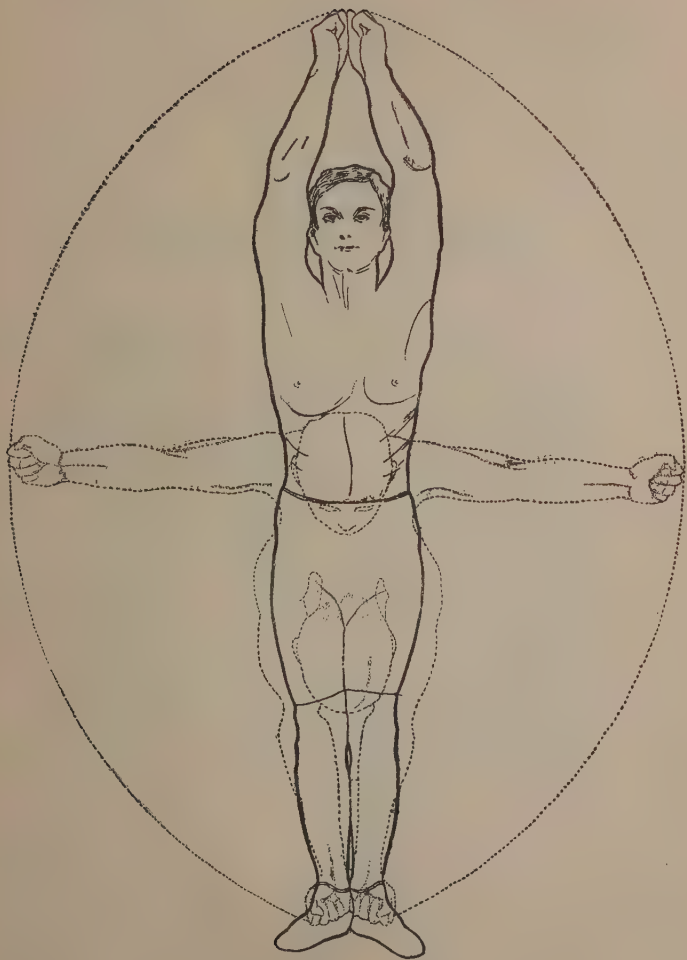


M. B. — 11

MUSCLE BUILDING EXERCISE

No. 12.

This exercise is a variation of what is known as "low bending exercise," with the exception that instead of the arms being brought down forward, in the same plane with the body, they are brought down sideways as shown in the chart. In performing this exercise, the legs should be kept straight, the knees not being permitted to bend.

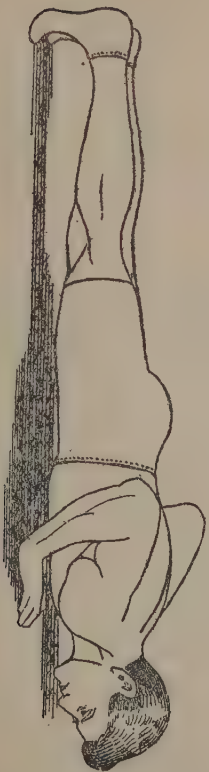


M. B. — 12

MUSCLE BUILDING EXERCISE

No. 13.

This exercise is known as the "dip." It is an excellent movement for the development of the shoulders and arms, and it brings into play nearly every muscle in the body. Assume position as shown in chart M. B. 13. Slowly raise the body from the floor, by straightening the arms. Then permit the body to resume the original position. The body should be held absolutely rigid during the exercise, and should not be permitted to bend at the hips. A more difficult and severe form of this exercise is known as the "one hand dip." This movement is similar to the first with the exception that one hand only is used.



M. B.—13

THIS SYSTEM PRACTICALLY COMPLETE.

I might continue indefinitely to describe various body exercises, dumb bell drills, and hundreds of other movements, which bring into play the external muscular system and tend to promote the blood circulation. But the series of exercises here described is practically all that is necessary, unless one desires to attain the very highest state of muscular perfection. In such cases it would be necessary to devote much time to wrestling, weight lifting, and apparatus work in a gymnasium.

CHAPTER XXIII.

MUSCLE BUILDING.

The desire to possess a robust body and great physical strength is an inherited instinct in man, one that was handed down to us from our forefathers, who lived in constant warfare and strife. In their days, Might was Right. Great physical strength and fighting ability meant success, just as weakness meant failure and death.

Though we need not to-day enter into mortal physical combat with our fellowmen in order to preserve our rights and life, a robust body and physical strength are, in other ways, essential to success. To-day success means a battle in which brain is the weapon, and to nourish the brain with abundant blood, a robust physique is absolutely necessary. It is true that occasionally a dwarfed anaemic may attain a high degree of success in life, but, all other things being equal, the man with red blood in his body, the broad-

shouldered, big-chested and powerfully-muscled man, in the end, is the successful man.

STRENGTH DETERMINED AT BIRTH.

Some physical culturists tell us that any man may become as strong as any of our professional strong men if he begin early enough to train the body. This theory is absolutely untrue and not based upon facts. A strong man is born and not made. As stated previously, at birth Nature sets a limit to the extent that we may develop. Nothing we can do will make it possible for us to pass that limit set by Nature. On the contrary, as a rule, through incorrect living and evil habits, we usually fail to reach the degree of perfection that it is possible to attain.

Some men are born never to attain a greater stature than five feet. Others are born to attain a stature of six feet, but adverse hygienic conditions may cause them to fall several inches short of reaching the limit set by Nature. What is true in reference to stature is true also as regards bone, muscle, and mind. We have, therefore, different types of human beings, some with slender bodies, small

bones, short trunks and vital organs to correspond. Then we have the opposite type, the heavy-bodied, thick-boned, large-trunked, and full-blooded being. Various intermediate types exist, that help to make the human race a composite group of various types and temperaments.

Thus we see that some men are built on the lines of the grey hound, others on the lines of the mastiff. What nonsense, then, to take a man who is born of the greyhound type, and attempt to develop him into a heavy-muscled Hercules! Yet many physical culturists hold forth such promises to the public. It is not to be wondered at that an athlete often breaks down from excessive strain in his attempt to reach the impossible goal.

From the foregoing facts it is apparent that one man may be perfectly developed, yet be comparatively slender, and another may be perfect in outline and be a veritable elephant. Everything depends upon the temperament and type of the man. As a rule, however, it is in the mean and not in the extreme that we find the type most admired. The most famous male models are men from 70 to 72

inches tall, and weighing from 175 to 200 pounds. In women, a similar type is the one most admired for physical beauty.

SYMMETRICAL PHYSIQUE.

Much stress is often laid upon the importance of developing the physique symmetrically. This is another matter that is carefully governed by Nature, and need not be given any special attention. Muscle growth is limited by the requirements of the body and the size of the bones that act as levers. If every muscle of the body be equally exercised, symmetrical development will come of itself. Such men as Sandow, Rolandow, Hackenschmidt, and other splendidly proportioned men, owe their condition simply to general exercise. Needless to say, had such men devoted their entire attention to the development of the shoulders alone, other sections of their body would have remained undeveloped, and consequently their form would have been unsymmetrical, but such condition is hardly possible, as nearly every form of exercise, especially exercises employed by the men mentioned, requires the use of the entire body.

In order that the maximum muscular development may be attained, it is necessary to tax a muscle to its limit. Show Nature that you require more muscle by taxing those that you possess to their extreme capacity, and Nature will respond, but not beyond the safe limit. Nature does not permit the growth of so great a bulk of muscle that under any condition there may be danger of breaking the bones upon which they act. It may readily be understood that if the enormous muscles of a strong man were attached to slender bones, and such muscles were made to exert their full power of contraction, the bones would snap.

The statement that a muscle must be taxed to its limit in order that it may be developed fully, may contradict the theory of some instructors. It is claimed by many that light work, if persisted in long enough, will also develop a muscle fully; furthermore, that such muscle is of superior quality. It is a common belief that extreme contraction of the muscles, such as is required in heavy weight lifting, wrestling, etc., develops slow acting muscles. We need merely take our well-known strong men as examples, to prove that

my claim is well founded. Every strong man before the public to-day owes his development to heavy weight lifting, wrestling, or similar strenuous work. Not one has developed himself by light work. This includes Saxon, Sandow, Hackenschmidt, Rolandow, and a score of other physical marvels that I might mention. Though these men are heavy, all weighing over two hundred pounds, each can perform wonderful feats in agility, such as only the most adept athletes are capable of executing. The four athletes mentioned can turn a somersault from the floor without the aid of a spring board or other apparatus. Rolandow is a wonderful bag puncher, Hackenschmidt a marvelous wrestler with lightning agility, and Saxon also uses his body with great dexterity. I, too, though a heavy man, and covered with massive muscles developed through heavy weight lifting, can turn a back somersault from the floor, and perform other feats requiring extreme quickness of muscular contraction.

One especial feat in dexterity that I can perform is evidence of the quickness of my movements. I take four coins, place them on the back of my hand, and toss them in the

air a few feet, catching them separately before they fall to the floor. This is a feat that is performed by but few jugglers, and is extremely difficult. That I can perform such a feat is the more noteworthy as my hands and forearm are so exceptionally well developed. All my life I have found special pleasure in performing feats of strength that brought into play my powerful forearm muscles. In fact, it is claimed by those who have made an effort to keep a record of the performances of strong men, that I have the strongest forearm and hands of any man in the world. I can, with ease, tear a pack of playing cards with my fingers, and have, on many occasions torn a small piece as large as a quarter of a dollar out of a full pack of cards. Therefore, if extreme muscular contraction has a tendency to develop slow action, my hands and forearm should be especially slow, which as I can prove by the feat with the coins, is not true. Careful observation has convinced me that the speed with which a muscle acts depends upon the activity of the brain. A quickly acting brain will cause rapid muscular contraction, and a slowly acting brain will be accompanied by slow motions.

The contractile force of a muscle is principally governed by the degree of nervous force exerted upon it. It often has been observed that men with great masses of muscle sometimes cannot perform feats of strength of which men with much smaller development are capable. This is due entirely to the fact that in some the power to transmit nervous impulses to the muscular tissues is comparatively feeble. As a rule, a quick-brained person, with an active nervous organization, is capable of exerting far greater muscular contraction than the person of a vital temperament.

Excellent examples showing how the contractile force of a muscle is dependent upon the degree of nervous force exerted upon it, are in the cases of madmen, or hysterical women. A frail woman, when under an extreme degree of nervous excitement, may possess the strength of a powerful man. I once witnessed a mad man who had to be overpowered in order to prevent doing himself and others bodily injury. While pinioned to the ground by seven or eight policemen, he would, with apparent ease, raise his head from the ground, though a heavy man pressed upon it with his full weight. I do not believe that the

strongest-necked wrestler could exert such great force under ordinary conditions.

While hysterical frenzy may give rise to almost superhuman strength, laughter and mirth will do the opposite. This fact is well known among wrestlers. It has often occurred that a wrestler has taken unfair advantage of his opponent by tickling him, for at the moment when the one that is being tickled laughs or tries to suppress a laugh, his strength for the time being is at a low ebb, a fact of which the opponent takes advantage, and consequently easily conquers his adversary.

THE VALUE OF WEIGHT LIFTING.

Since the contractile force of muscles depends, in a great measure, upon the degree of nervous force exerted, it follows that in muscle culture the nervous system should be given due consideration. Such exercises are best that cause the greatest degree of mental concentration. For this reason I have always advocated the use of heavy weights, or exercising with an apparatus that enables one to observe the degree of force exerted. I have just mentioned that my greatest strength lies

in my forearm and hands. I owe this strength to performing feats that required great mental concentration. At first I practiced with a grip testing machine daily, and after reaching the limit of the capacity of the machine, I devised new means of testing my grip. I would take an ordinary broom and place weights on the straw, and then, by gripping the handle with one hand at a given point, raise the broom horizontally from the floor. As my grip improved I would increase the weight on the broom, or grasp the handle nearer the end. I continued such tests until I succeeded in raising $11\frac{1}{2}$ pounds fastened to the end of a 40 inch bar.

The use of a spirometer for the purpose of developing the respiratory capacity is based on the theory that, in order to develop extreme muscular power, it is necessary to concentrate the mind upon the work. The entire matter evolves itself simply into one of proper mental concentration. It is for this reason that I always advise my pupils to exercise before a mirror, that they may observe the action of the muscles, expansion of the chest, and motion of the arms, or other parts of the body. Hap-hazard and careless exercise is practically a waste of time.

CHAPTER XXIV.

THE NERVOUS SYSTEM.

The nervous system is the great governing system of the body. Every muscular act, every organic function, every indication of life manifested by the millions of cells that help to make up the human body, is directly governed by the nervous system. The center of this wonderful organization is in the brain, and just as a net work of wires branches from a central telephone office, millions of fibres branch out from the brain to every part of the body.

Health demands that we give the nervous system every consideration possible. No other part of the human body is so sensitive to abuse. To begin with, the nervous system must be nourished with abundant rich blood; secondly, it should not be abused by overwork; thirdly, it requires ample rest. If we abuse the nervous system by underfeeding it, overworking it, and giving it no rest, we must

pay the penalty in the form of insanity, nervous indigestion, mental depression and weakness, physical weakness, and hundreds of other abnormal conditions too numerous to mention.

STIMULANTS DANGEROUS.

Bear in mind that there exists no nerve food that may be purchased at so much per bottle and administered with a tea spoon or in tablet form. There do exist dangerous poisons, that deaden the nervous system for the time being, and may apparently relieve pain and depression, but such "foods" only rush the victim all the more rapidly to final destruction. There is but one way to nourish the nervous system, and that is through the blood. Since breathing is the most important factor concerned in the maintenance of rich pure blood, it follows that the condition of the nervous system is largely governed by the manner in which we breathe, shallow breathing invariably meaning nervous exhaustion.

In discussing the manner in which the nervous system may be overworked, and strained, we enter upon a subject of which

volumes might be written. Hundreds of vices, habits, and practices common among men and women, may tend to weaken the nervous forces, and permanently derange them. Unquestionably at the head of these abuses may be mentioned the improper care of the sexual organization. The branch of the nervous system that governs the reproductive organs is the most sensitive and active in the body. No set of nerves responds more readily to the brain, and no nerves reflect more actively upon the vital organs. Consequently abuse of the sexual nerves affects the entire nervous system most disastrously. Unfortunately a ban has been put upon the discussion of the function of the reproductive organs. Even the most intelligent men and women go through life in entire ignorance as to the many ways this dangerous force may wreck not only their lives, but the lives of their children as well. It is with reluctance that I must close the discussion of this subject. To enter more fully into the matter here, would subject this book to the risk of being excluded from the U. S. mail.

The second great abuse of the nervous sys-

tem is excessive mental work. The strain of continuous mental concentration is most severe on the nerves. Equally as dangerous as excessive mental work is the mental phenomenon known as worry. The old saying, "Worry wears the strongest life to shreds" is very true. Worry, like fear, retards the activity of the blood circulation and the process of digestion. Fear and worry usually go hand in hand, thus doubly affecting the health. To advise any one not to worry is usually mere waste of time, as it is advice that cannot be easily followed. It is a fact, however, that worrying becomes a habit with many. Persons who are more or less dissatisfied with their lot in life have a tendency to become chronic worriers. They become irritable, and quarrelsome, and if nothing presents itself to give them cause to worry and excite themselves unnecessarily, they deliberately seek trouble.

Some men and women are born with excessively active and sensitive nervous systems, and may be said to have a nervous temperament, that is, in such persons the nervous system is extremely active compared to the degree of vital force of the body. Unless such

a temperament is checked, in time the nervous system will gain the upper hand, and finally physical breakdown will result. It may interest the reader to know that I happen to be blessed, or cursed, (I do not know which) with a nervous temperament. I am by nature as restless as a wolf. It is most difficult for me to remain quiet, my nerves driving me to constant action. Fortunately I have learned to prevent undue waste of nervous energy, besides being able to feed that ravenous enemy with abundant blood, so that I retain a normal weight and high degree of strength.



CHAPTER XXV.

THE VOICE.

The respiratory apparatus is the basic factor in tone production. It is true that the delicate organs known as the vocal cords are the prime source of all tone production, but it is the formation of the chest and the quality of the chest tissue that determine the real quality of the tones produced by the human voice.

The human voice and the various organs employed in the phenomenon of tone production, may appropriately be compared with the violin. The vocal cord is represented in the violin by the strings. The column of air emitted by the lungs causes a vibration of the vocal cords, similarly as the violin bow, by virtue of its friction on the strings, causes vibration. As is well known, the principle factor in the quality of the tone of a violin is the conformation of the body of the violin, and the quality of the wood employed in its manufacture. This same phenomenon is true in reference to the

human voice. It is the conformation and quality of the tissues of the chest that determine the quality of the tone produced. If the wonderful vocal cords of a renowned tenor could be transferred to a flat-chested, anaemic person, it would be found that the once-marvelous cords would emit but a flat, metallic sound.

A simple experiment which offers ample evidence that the chest is indeed the sounding board of the human voice, is as follows: If the receiver of a telephone, the part of the telephone which is spoken into, be pressed firmly against any part of the chest, especially the lower section, a few inches above the bottom of the breast bone, it will be found that in speaking, the vibration of the chest, (the sounding board), is sufficiently pronounced to cause a corresponding vibration in the receiver, thus making it possible to transmit speech almost as clearly as though the receiver were used in the ordinary manner. The larger the chest and the better it is adapted to tone production, the more successful will be the result of such an experiment. In flat-chested persons, with

poor muscular development, the waves **may** be so feeble, that only the faintest vibration will occur in the chest walls, and in such instances it would be impossible to affect the telephone apparatus.

In song and speech, breath control is a very important factor, just as in violin playing proper bowing is a vital element. In order to have perfect control of the voice, it is necessary that the breathing muscles be thoroughly trained to obey the mind. It is necessary, at all times, that one be conscious of the volume of air that is at disposal for tone production, and the breathing muscles must be under such a high state of control, that they may instantly respond to any demand made.

Ample breathing capacity is the keynote to success in singing, and in order that perfect breath control may be had, the form of respiration should be diaphragmatic, and not chest. The truth of this statement has been proved again and again by the fact that all the world's greatest singers employ this method. No chest singer has ever attained fame, or even recognition.

While many of our great teachers of sing-

ing employ different methods of training the diaphragm, in the end all attain practically the same result. The diaphragmatic action in singing is the same as that in normal respiration. I have examined the respiration of many of the world's greatest singers, and have found such to be the case. Therefore, in order to train the respiratory apparatus to attain the highest degree of proficiency, it simply is necessary to practice diaphragmatic breathing and full chest breathing. The first method of breathing must be practiced in order to attain breath control and great diaphragmatic capacity; the second method, to increase the size and mettle of the chest, in order that there may be a high degree of resonance, volume, and color.



CHAPTER XXVI.

LEANNESS.

The body in normal health is not burdened by too great deposits of fat, nor is it deficiently supplied. Either extreme, Obesity or Leanness, is an indication that there exists a decided functional derangement. The body when in normal condition, is covered by a light deposit of fat. Such a deposit has a certain physiological value. In the first place, it helps to preserve the heat of the body. In lean persons the radiation of heat is too great, thus overtaxing the vital organs in their endeavor to preserve normal bodily temperature. Fat acts as stored energy, which may, in case of disease, be called upon to supply the blood with carbon. External deposits of fat help to give the body a suitable padding, so that the bones and muscles may not appear too prominently, thus enhancing the beauty of the body.

Leanness, when not due to food starvation, is usually caused by some derangement of

the digestive system, or is the result of shallow breathing. In order that the proper amount of adipose tissue, fat, may be absorbed and deposited, it is highly essential that the processes of digestion, absorption, and elimination be normal; secondly, the blood must be supplied with sufficient Oxygen, and last but not least, there must not be undue waste of nervous and physical energy. In many cases leanness is due to excessive nervous activity. The nervous system being a great consumer of food, if kept too active through undue worry, mental strain, or other causes, requires such a vast amount of nourishment that but little is left to be turned into fat. Hence, excessively nervous persons are usually underweight.

CONSERVATION OF NERVOUS ENERGY.

The first step to overcome leanness is to learn to control the nervous system. Avoid all undue haste: whenever it is possible, walk slowly and lazily. Imitate the fat man, who never seems to be in a hurry. When sitting, do not cross the legs, drum with the fingers, or make any other unnecessary movements.

Avoid waste of nervous energy in every possible manner.

VALUE OF DIAPHRAGMATIC BREATHING.

Make every effort to improve the digestive powers. Diaphragmatic breathing is of the greatest value in the cure of leanness. As the circulation of the blood in the abdominal region improves, as the result of greater activity of the abdominal contents, digestion, absorption and elimination are correspondingly increased. Eat such food as is usually eaten by normal persons, but be sure to eat slowly. Masticate the food well, and if possible, have a congenial companion when eating. Mirth promotes digestion, grouchiness retards it. When eating alone, one is likely to think of unpleasant things, rather than those that are pleasant. Systematic breathing gymnastics are of the greatest value in leanness, and often are all that is necessary to overcome the trouble. As the habit of deep breathing is acquired the blood improves, and thus is capable of nourishing the nervous system, no matter how active it may be. Cold baths should be avoided, for, as stated pre-

viously, they tend to reduce the warmth of the body. Care should be taken as regards clothing, too much or too little being equally harmful.

THE STUFFING CURE.

Leanness is often treated by what may be termed the "stuffing cure." In this treatment the patient is made to consume vast quantities of milk, often from eight to ten quarts a day. Added to this are raw eggs by the dozen. In rare instances this cure has resulted in rapid increase in weight, but in the majority of instances the stomach rebels at being thus abused, and the patient becomes nauseated at the mere thought of eggs and milk. I have observed that persons who gained weight by this so-called "raw food" treatment, added fat only in certain sections of the body, especially in the abdominal region, and internally.

The treatment I have suggested, while slow, produces a normal increase of weight. Perhaps about four-fifths of my pupils of the past were underweight, and the results attained indicate that the method I advocate strikes at the seat of the trouble.

CHAPTER XXVII.

OBESITY.

Over deposit of fat, Obesity, is far more dangerous to the health than Leanness. Statistics show that fat persons do not live as long as thin ones, though it would be a difficult matter to convince a fat person of this fact. Usually he considers his condition an indication of health. The average fat man often pities his lean brother, whereas the lean man might well pity the fat one.

Excessive accumulation of fat on the body, besides having a tendency to shorten life, and hampering bodily activity, also dulls all the senses. Tests show that in thin persons all the senses are more acute. Fat interferes with the action of the nervous system.

It is needless to say that the accumulation of internal fat impedes the action of the lungs, thus making the victim shortwinded, asthmatic, and subject to Pneumonia. Obese persons, if they do not die of heart trouble, usually succumb to Pneumonia.

Obesity is far more easily corrected than Leanness, if the patient will make determined

efforts to combat the trouble. The first step should be to avoid the consumption of excessive food. This, to fat persons, is usually a great hardship, for eating is one of their life's greatest pleasures. One meal a day is ample, and in extreme cases fasting for several days at a time is advisable. Vigorous muscular exercise should be taken twice daily. Massage, and steam baths are also of value when combined with fasting and exercise. Of the greatest value, however, is forced breathing—Internal Exercise. The activity produced in the internal body through forced breathing has a strong tendency to remove internal fat, which is so dangerous to the health. Apoplexy, fatty degeneration of the heart, and similar troubles, are characteristic in fat persons. Therefore, the first step should be to remove the internal fat, then the external fat. This can be accomplished readily through deep breathing. I have had innumerable cases where from eight to nine inches decrease in abdominal measurement was brought about through breathing gymnastics. After the internal fat has been removed, thus giving the heart more room to act and the lungs greater power, it becomes a simple task to work and starve off the external fat.

CHAPTER XXVIII.

CONTRADICTORY THEORIES.

There is an old saying "A thousand men, a thousand minds." This applies especially in the case of teachers of the Science of Health. Our literature on the subject is one mass of contradictory theories. Our physical culturists seem to be struggling in the dark. The medical profession, in its writings, shows that it, too, cannot agree upon the subject. Needless to state, the teachings set forth in this work have been, and will continue to be, questioned by some physicians and physical culturists. That breathing is the principal function of life, is an acknowledged fact, but at this point we begin to diverge in our belief. Only recently a physician made the "remarkable" statement that the function of respiration is not the oxygenation of the blood. It is his claim that the lungs are a kind of dynamo that generates electricity during respiration,

and that the electricity thus generated vitalizes the blood. Another physician makes the statement that the lungs absorb more Oxygen during the waking hours than during sleep. Occasionally may be found an apparently intelligent man who claims that chest breathing, and not diaphragmatic breathing, is the proper method of respiration to be employed habitually. So I might continue to mention hundreds of strange and contradictory theories regarding the function of respiration, and other branches of hygiene. While I am always prepared to defend any statement or theory that I have put forth in this work, I must decline to enter into a lengthy controversy with every layman who might contest my views. I shall always be pleased to defend my position in the columns of a medical magazine or any other publication which readily accepts such matter.

HOLDING THE BREATH.

One of the most common practices employed in breathing gymnastics, and which I have combatted most vehemently for years, is that of holding the breath. Nearly every instructor of deep breathing employs among

his exercises a number that necessitate the holding of the breath. It is my claim that the practice is absolutely useless, and theoretically most harmful. It is a well-known fact that the entire blood supply of the body passes through the lungs during forty or fifty heart throbs. If, therefore, the breath is held a half minute or more, that blood is made to circulate through the lungs without being given the opportunity to exchange Carbon Dioxide for Oxygen. If the practice were repeated again and again for half an hour or more, severe depression would result. When instructors that employ this method are asked why they do so, they confess that they have no special reason. In some instances it is explained that holding the breath forces the air into the lung cells.

I cannot conceive of a single logical reason for holding the breath. Any one with but slight knowledge of the anatomy of the lungs, knows that holding the breath does not force air into the cells to any greater degree than would an ordinary deep breath. Surely the practice does not in any way tend to educate and develop the breathing muscles. On the

contrary, when the epiglottis is closed, there is a tendency to relax the breathing muscles, and relieve them of the task of keeping the chest cavity enlarged. Since no logical reason can be given for the practice, and no evidence can be presented that it has ever produced remarkable chest development, respiratory capacity, and breath control, why should it be recommended? My opinion is that it is an old practice that grew upon us without any reason, and has been kept in vogue simply because it offered a variation as a respiratory exercise.

BREATHING TUBES.

For many years various forms of "breathing tubes" have been advocated for the purpose of assisting in the development of the breathing function. In my opinion the only merit such devices have, is that they may offer an incentive to practice deep breathing. Nature has supplied us with breathing tubes—the nostrils. We cannot improve upon Nature in this respect. The nostrils offer the proper resistance to the entrance of air to the lungs; on the other hand, many "breathing tubes" I have examined, offer such high resistance that their use by a person with a

tendency to Emphezema would lead to grave danger of injuring the lung cells.

Among other "feats" advocated in breathing gymnastics are "blowing spit balls," blowing out candles, and similar acts. Such practices are of little value in the development of the respiratory function. The forcible expiration made in such efforts may tend to strengthen the expiratory muscles, but beyond this they have no value.



CHAPTER XXIX.

SHORT NOTES

A gallon contains 231 cubic inches. The average man can, therefore, with one deep breath, inhale a little more than one gallon of air.

Careful measurements show an increase of from one-quarter to three-quarters of an inch in stature during deep inspiration, and everything points to the supposition that constant practice during youth will tend to materially increase the height when matured.

Heartburn, which is a form of indigestion, immediately disappears upon taking a dozen deep diaphragmatic inspirations. This massage of the stomach will, if performed regularly, cure this annoying trouble. The superiority of this cure over the usual method of dosing the stomach with some alkali to neutralize the acid, should be apparent to all.

Did you ever notice the rhythmical puffing of a locomotive, when standing in a railroad station, just before making a trip? That engine is storing energy. The puffing is the noise made by the "blower," which is producing a forced draught. In

the human engine, a similar phenomenon takes place. At night, when we sleep, we too turn on our forced draught, so that we may store abundant Oxygen, which we may later, during the day, consume as it is required.

Imagine a system that would transform the foul sewage of a city into pure drinking water in a moment's time. That is precisely what the lungs do, when one breathes correctly and fully. The dark venous blood, foul with the ashes of burned up brain cells, and debris of worn out tissue, is transformed in the lungs at every breath, into pure, bright, red blood.

"There are very few organic diseases that will not respond rapidly and satisfactorily to a treatment that has for its object the restoration of the natural functions."

The strength of a muscle is not directly in proportion to the area of its section; its average contractile force, in a healthy man, is about five hundred pounds for every square inch of its section.

Modern psychology laughs when it reads of the saints of old times, who after they had violated every conceivable canon of health, for the sake of greater piety, were at last, as it was supposed,

tempted to the devil, in one way or another. When they had violated bone, and muscle, and nerve, and lungs, and brain, and half ruined their physical selves, they thought the fantasies of their outraged brain to be the devil—and so it was,—the devil of violated law.

My experience has proved that the greatest defect in the physique of most women is found in the abdominal region. On account of their manner of dress, and lack of activity of the abdominal and waist muscles, most of them have absolutely no control over the diaphragm.

Do not lose sight of the fact that however young or old, sick or infirm, you may be, still you possess, in every minute detail, all the machinery that is needed with which to make a perfect body. All you lack is functional power. This can be developed at any time.

In ordinary language one may divide strength into two varieties—physical and constitutional. The latter is the strength most to be desired. Constitutional strength means longevity, ability to resist disease, and robust health.

When children have reached the age when they should be sent to school, that is, when the brain is in condition to be rapidly developed, then also is the

time to develop the body. Exercise should be light at first, and increase gradually with age. At the age of twelve they should still be spared; no attempt to develop muscle should be made until they are fifteen years of age.

It is woman's ambition to be developed as perfectly as possible, and as her most prominent defect is in the lack of well developed shoulders and chest, the value of respiratory exercises should be apparent.

We thank President Roosevelt for making popular the term "strenuous life," but no man is fit for the strenuous life whose vision is blurred, whose brain is clouded, whose ears are dull, whose hands are shaky, who lungs are a mass of corruption from improper care, whose body is tormented with the agony of constipation and whose vitality is sapped with constant drainage of life's forces.

Emerson said, "A sick man is a rascal." As he looked at his own delicately reared son, he said, "Poor fellow! How much he loses by not having to go through the hard experience I had in my youth."

The experience of Horace Mann at college is typical of much of our education. He says, "I was taught all about the motions of the planets as carefully as if they would have been in danger of getting

off the track if I had not known how to contract their orbits, but about my own organization I was left in profound ignorance." Grand and useful man as he was, he confesses that he went through life a cripple in the use of his mental faculties because of his ignorance of his body, how to care for it, and the close relation between the body and his mind.

Many a well person becomes a chronic invalid in traveling for health, when it is to be found at his side.

Two of the most prominent physical culturists of the past were strongly opposed to the theory that breathing gymnastics were a physical necessity. They maintained that simple exercise gave the lungs all the exercise they required. One of these instructors had a breathing capacity of but 180 cubic inches; the other, 220 cubic inches. Both had large chests, and were phenomenally "strong" men. Both died of Consumption.

A nerve cell consumes four times as much Oxygen as a muscle cell.

The ability to resist cold is principally governed by the degree of respiratory power. In cold climates large breathing capacity is especially desirable. On the other hand, in the Torrid Zone comparatively

good health may be retained, even by a shallow breather. The largest lunged people in the world are the Mountain Climbers in the Alpine regions, who not only must be able to withstand the cold, but also are compelled to breathe air that is quite deficient in Oxygen. The Eskimo, in proportion to his height and weight, has excellent breathing capacity. The Southern Negro, the Mexican, and inhabitant of the Tropic regions of South America, have poor respiratory power. The breathing capacity of the average adult healthy man in these Southern regions is not more than 200 cubic inches, or 50 cubic inches less than the average of his Northern brother.

“Chronic invalids are, as a rule, shallow breathers—that is, they seldom use more than a fraction of the lungs in ordinary inspiration.

“The immediate and remarkable curative action which respiratory gymnastics produce on consumptives can readily be understood when you stop to consider that tuberculosis begins, as a rule, at the top of the lungs, owing to the inability of using that part of the lung in respiration; consequently, the apex of the lung becomes softened and degenerated, and tubercles form under slight provocation. In treating a case of consumption by respiratory exercise, the first thing to do is to exercise the lungs in such a manner as to produce an even and active circulation through them. We thus accomplish what no medi-

cine in existence can produce—an even, active, and healthy circulation through the top of the lungs, producing healthy cell granulation and rapid cicatrization of the existing ulcers.”

Francis Willard once said, “The time will come when it will be told as a relic of our primitive barbarism, that children were taught the names and lengths of the rivers of Thibet, but were not taught the wonderful laws on which their own bodily happiness is based.”

Remember that breathing impure or stagnant air and eating good food, besides taking good care of yourself otherwise, will likely produce disease; poor food and good air is not nearly so dangerous.

“Organic disease strikes at the very foundation of life. Your weakness is its strength; and the crippling of your resources is the weapon with which it slays its victims. Take away the weapon by developing your natural resources, and you will virtually vanquish the enemy.”

The first object to be obtained is to produce a perfect vascular membrane within the lungs, that you may be able to absorb Oxygen and eliminate carbonic acid freely. The second is to enable the

diaphragm to aspirate in sufficient air to fill the lungs to the apex, and the third is to give you perfect power of collapse of the lungs, that you may throw out all the inspired air possible at each expiration.

If you practice making long strides, you will, in a short time, naturally walk with a more elastic step and longer stride. This applies as well to breathing as to walking. Practice enforced respiration, and in a short time you will naturally breathe deeper and more slowly. Printers' ink can not describe the benefits derived therefrom.

Nature seldom presents her bills on the same day that you violate her laws. But if you overdraw your account at her bank and give her a mortgage on your body, be sure she will foreclose. She will loan you all you want, but like Shylock, she will demand the last ounce of flesh.

Parents should watch the growth of their children's lungs and also know their condition at all times.

The lung capacity of over five thousand young ladies at Oberlin (Ohio) College, Wellesley, and the University of Nebraska, averages 152 2-3 cubic inches. I consider this extremely small, as it should be nearer 200 cubic inches. As these meas-

urements were taken in the Eastern, Western and Middle sections of the United States, it shows that the average is not that of any particular region. These young ladies, who represent the coming generation, have a deficient lung capacity.

If you have not the vitality or time to exercise all the muscles in the body, then at least exercise the most important.

What a commentary on our modern civilization that over 300,000 people should die annually from an absolutely preventable disease, consumption. Seneca said, "The gods have given us long life, but we have made it short."

I consider it criminal negligence to allow a child to mature without watching its growth physically as well as mentally. Had I not almost accidentally cared for myself at the age of eighteen, I might to-day have a lung capacity of about 200 cubic inches, have enlargement of the heart, and perhaps be a physical wreck.

"Everybody tells you to go out and breathe in the pure air, but can you use it? You go South or West, or visit Europe, and your physicians tell you 'Inflate your lungs.' You make the attempt, but the respiratory muscles do not respond, they can not re-

spond, because they are weak and need developing. You might as well try to lift 500 pounds when you can only lift 100. You can't do it because the muscles are weak."

Every pound of blood in the body is equivalent to eight or ten pounds of the weight of the body.

The respiratory muscles are the most powerful in the body; if the estimated strength of the arms is 500 pounds, that of the respiratory muscles is from 1,000 to 2,000 pounds. Many of the muscles of the abdomen, chest, back and neck are directly used in enforced respiration. The power required to expand the chest from three to four inches is estimated to be not less than from 1,000 to 2,000 pounds.

Benjamin Franklin said, in his sayings of Poor Richard, "If you will not hear Nature, she will surely rap your knuckles."

"There are three objects to be accomplished," says Dr. Bowman, "in order that organic disease may be successfully treated, that every human being may possess a perfect organic body. These three objects constitute the foundation of our whole life, without which we can never be perfect; with which we can never be imperfect."

Increasing lung capacity does not mean stretching the tissue; you increase the permeability of the tissue and strengthen the power of the muscles which control respiration.

John Newton said with grim satire, "Last Sunday a young man died here of extreme old age at 25!"

For every seventeen cubic inches of bone, muscle and sinew, you should have one cubic inch lung capacity.

The blowing of soap bubbles is to be highly recommended for children.

The muscles employed during enforced respiration are the most powerful in the body, and directly reach the most vital parts of our system.

South said, "Old age seizes upon an ill-spent youth like fire upon a rotten house."

Dr. Hutchinson says: "It is self-evident that, as the lungs are the sole receptacle of the air we breathe, whatever disease there may be which affects their permeability for air will be manifested

by the spirometer. The spirometer gives distinct indications at the early period of consumption, and these indications become more obvious in proportion to the progress of the disease."

Eat to live and live to eat, but do not go to either extreme.

When Dr. Charcot, the great French physician, was on his death-bed, the foremost medical men in Paris were mourning the great loss to their profession, the sick man said, "I leave behind me four great physicians, Air, Water, Exercise and Diet."

"If you would have good health, go out in the sunshine. Sickness is worse than freckles."

All great singers "sing from the diaphragm." A chest singer is always a failure. A powerful and well educated diaphragm is the first requirement in singing.

The quantity of respired air governs the quantity of blood.

Speaking of the stomach, Sydney Smith says, "Some men dig their graves with their teeth," which is only another way of saying Seneca's famous observation. "The stomach begs and clamors, and

listens to no precepts. And yet is it not an obdurate creditor; for it is dismissed with small payment if you will only give it what you owe, and not as much as you can."

Children are naturally correct breathers, and remain so until their vocation, style of dress, and habits interfere.

Chest expansion should be measured in the region of the lower chest, about an inch above the bottom of the breast bone. It should not be measured, as is usually done, immediately under the arm pits. Less than $2\frac{1}{2}$ inches is dangerously low.

Health lies in the mean and not in the extreme.

When you indulge in respiratory exercises you not only increase the capacity of the lungs, but also increase the Oxygen absorbing capacity of the capillary blood vessels.

The highest respiratory pressure recorded is 69 ounces per square inch.

Brain workers must learn this; that nerve cells are the reservoirs of mental force. Their contents are exhausted by study and thought. Unless good, rich blood can reach them they will not be renewed

—which means starvation of mind, poverty of thought and ideas, poor memory, lack of power of attention, nervousness, irritability and the beginning of many other sources of mind troubles.

A doctor without a conscience is the worst of men, and the woods are full of them.

The brain plays an important role in digestion. The glands which expel the fluids that assist in digestion are directly controlled by the nervous system. The quantity of gastric juice and saliva freed depends upon the eagerness with which food is sought.

The Italians have a proverb, "Shut the door to the sun and you will open it to the doctor."

The energy exerted by the heart every twenty-four hours is sufficient to raise a weight of 100 pounds nearly half a mile.

An ordinary gas flame consumes as much Oxygen as four people.

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